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THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., JANUARY 7, 1892.

THE WEEK IN IRON CIRCLES.

General Features.

A gentleman largely interested in the manufacture of railroad supplies is our authority for the statement that, up to January 1st, the contracts for box cars, present and immediately prospective, footed up no less than 53,000 cars, and still the inquiries continue active. The sales of steel rails up to December 1st were something over 1,100,000 tons and the shipments about 1,000,000 tons. This is less than the ordinary estimates for renewals alone, and the logical inference is that the railroads must soon begin to buy more largely. Some idea of the pressing needs of the railroads can be obtained from the fact, that the crops to be moved Eastward this year are 60 per cent. greater than last, and 40 per cent. greater than the "big year," 1889. Money is again easy, and we have rounded into the new year with no serious failures as the result of the general liquidation. The business failures for 1891 were 6 per cent. greater in number and 10 per cent. greater in liabilities than in 1890. There is not much doing at the various iron centers. The buying movement at Chicago has diminished during the past week; there have been enough transactions, however, to prevent complaints of extreme dullness, small orders having been numerous. The cutting of prices on the part of coke furnaces still continues, and some extremely low figures are reported as just made by two or three Southern furnaces. The general feeling exists that the year 1892 will bring a larger degree of prosperity than has been witnessed in a long time, and that prices for pig metal will improve materially. While the production is so large that no heavy upward movement seems possible, yet a general stiffening all around seems likely to be in order within the next few months The encouraging features of the Buffalo market seem to be overbalancing the discouraging ones. Naturally there has been comparatively little new business the past week, but enough small orders have been placed to make a fair total. Prices continue low with present production in excess of consumption. At Detroit, inquiry for a considerable quantity of Lake Superior charcoal and Bessemer iron was the only happening of any note, beyond a few small orders for a car load or two for present needs. At St. Louis pig iron is m. ving more freely. A feature of the Pittsburgh market is the increased demand for pig for steel castings. The coke trade is dull, the only feature of interest being the absorption of the Hostetter Coke Company by the Fricks at a consideration of $1,500,000 in the bonds of the Frick Company. This will increase the Fricks' holdings to 9,700 ovens. Prospects of railroad building for 1892 are considered good, in the light of the very small figures of new mileage for 1891. Since the year of our greatest railway building, 1887, when almost 13,000 miles of new lines were ded, the falling off in construction has been very rapid, the new mileage for each of the last five years being as follows: 1887, 12,878; 1888, 7,066; 1889, 5,706; 1890, 5,739; 1891, 4,168. In 1886 there were 9,018 miles added, and in the following year the construction increased over 50 per cent.; but the four years preceeding 1886 showed an era of diminishing railway building more marked than that of the last five years, the new mileage footing as follows: 1882, 14,569; 1883, 6,743; 1884, 3,924; 1885, 2,982. It appears, therefore, that in two only of the last ten years the addition of mileage was less than in 1891. In those ten years the increase aggregated 68,800 miles, or an average of 6,880 miles per year. Connecticut, Delaware, Nevada and Mississippi are the only States in which no new tracks were laid. In number of miles laid Pennsylvania leads with 260 miles; Georgia, 237 miles; Washington, 228 miles; South Carolina, 212 miles; New York, 198; Montana, 188 miles; Virginia, 188 miles; West Virginia, 188 miles.

The Local Situation.

The perceptibly stronger feeling in iron circles is responsible for the resumption of activity on the part of all the kindred lines, notably in the vessel and ore trades. It was thought and, indeed, hoped in some quarters that the Winter might be allowed to pass before entering upon business enterprises which, in the very nature of things, must be more or less of a speculative character until the proper season arrives for their determination, but as it looks now, there will be no end of fretting on all hands until something definite is accomplished by way of a settlement, one way or another. The vessel men, it is affirmed, are going in for a better rate; the ore men, as yet on the defensive, and unwilling even to talk about the probable price of their product, are nevertheless known to harbor good grounds for believing that the price of new ore will be from 75 cents to $1 higher than last year, and the furnacemen are in a position of doubt whether or not any such advance can be paid. The situation, as it appears on the surface, is this: The extremely low price of Lake Superior ores, and of its products, all the past year, has proved a serious loss to the Southern furnaces which, in better times, have swamped this market with their iron, which they could well afford to offer in competition with local prices. Since the cutting, however, of all the profit margins, hereabouts, the Southern furnacemen have experienced hard times, as is evident by the regaining, on the part of valley furnaces, of the trade which, for a time, had been lost. An advance of, say a dollar a ton in ore, would mean an increase in the cost of making pig iron of two dollars a ton, and the question is whether, the advance granted, Southern iron would not again come to the front and check any active movement in the Central West. In these days of close competition and narrow margins the range of extreme fluctuations is never large, or, at the utmost, more than effervescent. Thus it comes that the problem that presents itself to the combined ore producers and vessel men is one that appeals not only to their immediate interests, but to any further connection they mean to retain with the iron business. The furnace trade is alive to the uncertainties of the situation, and, while disposed to grant any reasonable advance that may be asked by their furnishers of the raw material, they will hardly feel like going in to buy heavily unless, perchance, they should by the time of the beginning of ore sales have enough profitable orders on their books to warrant such action. If, for instance, the opening sales of ore should be 75 cents higher, some furnacemen who are now supplied away into July will hold off, in the expectation of picking up what they want later on, at a better rate. This is particularly true of non-Bessemer ores. On the other hand, the ore men dispute the feasibility of any such position on the ground that any ore firm that had disposed of a large part of its output at a considerable advance, would decline to cheapen the remainder and thus jeopardize the price of the ore already sold, in the shape of a rebate, as was the case with one leading mine some years ago. The coal men, too, profess to feel no anxiety over the resolution of the vessel owners to ask better going rates. Most vessels, they say, require some sort of ballast on Lake Superior all the year 'round, if only as a matter of safety, so that for this important reason alone the great majority of boats will take up coal, even at a smaller rate; and it is further asserted that the boats that have paid the most profits, one season with another, are those that have steadily taken up coal, no matter how high the down freight, in preference to going up light, provided always that they had good dispatch. In the meantime, the furnace trade reports a good deal of activity, and the business is evidently improved, both in volume and in price.

THE SOUTH IN 1891.

For the most comprehensive series of industrial reviews of the South and Southwest we are indebted to three enterprising contemporaries, the *Manufacturers' Record*, of Baltimore, the *Tradesman*, of Chattanooga, and the *Age of Steel*, of St. Louis. The *Record's* summary of new enterprises inaugurated in the South appears elsewhere in this issue, and is certainly a splendid showing for a period of comparative depression, even allowing for shrinkage by reason of many projects which failed to materialize except on paper. The *Tradesman's resume* covers all of the important industries of the South, and is a magnificent piece of statistical work. The marvelous progress of that great section in the production of crude materials is fully set forth and certainly admits of no parallel in the history of iron-making. The *Tradesman* is wise enough to see, however, that true prosperity must come to the South only through a diversification of industries. No truer words were ever penned than these:

As to manufactures, beyond some coarse cottons, raw irons, common furniture and a small quota of our plows and other agricultural implements, rough lumber and shingles and rough castings—leave these out and you leave out the list. We make not one in fifty of the engines our industries require. We make no nails, no wire or wire rod, no cutlery, no wrought pipe, no chains, no carpenters' or other tools, no high grade furniture, very little, if any, of the finer grade cotton textiles. We are as absolutely dependent on foreign and Northern mills for steel rails, on their spindles for all high grade and fine textiles, on their shops for 90 per cent. of even our rudest tools, such as hoes and axes, picks, spades and shovels. All our residences are equipped with Northern made furniture, carpets and hard wood mantels, and what is peculiarly humiliating about much of this is that these very articles are made of Southern raw materials that are among the best in the world. Isn't it time our commercial bodies, farmers' orders, manufacturers' associations took hold of this question of industrial independence and started it toward practical solution.

The South and Southwest do well, too, in agitating the subject of deeper harbors and more navigable waterways, and the *Age of Steel* has performed a public service in calling out a series of noteworthy articles by leading public men in reference thereto. Its issue of January 1 is instructive alike to the business man and the statesman.

THE NEW FRENCH AND AUSTRIAN TARIFFS.

France and Austria have recently made important changes in their tariff laws. The schedules particularly affected are those relating to iron and steel. A study of the changes made in the French tariff shows that the advanced duties affect ferro-managanese, ferro-aluminum, ferro-chrome, puddled bars and steel rods, thin sheets, black plates, iron and steel rails, crude axles and tires, and scrap iron and steel. In a word, the increase of duties is general, with the exception of steel ingots, billets and rods. The effect of the new duties, we learn from the *Iron and Coal Trades Review* (London), will be that pig iron will have to pay a duty of 20 fr. and 15 fr. per ton of 1,000 kilogrammes under the special and reduced tariffs respectively; puddled bars, 50 fr. and 45 fr.; iron rods, 75 fr. and 65 fr.; rails (iron and steel), 70 fr. and 60 fr.; axles and tires, 100 fr. and 80 fr.; tool steel, 200 fr. and 150 fr. Steel ingots are to be reduced to 60 fr. and 50 fr., respectively; steel blooms and billets, to 70 fr. and 60 fr., and steel rods, to 75 fr. and 65 fr. The French Senate has adopted all the duties as voted by the Chamber of Deputies, with the exception of that on scrap iron and steel, which has been raised from 1 fr. and 75 c. per 100 kilogrammes under the general and minimum tariffs, respectively, to 2 fr. and 1 fr. and 1 fr. 50 c. In other words, it has been just doubled, and scrap iron and steel will have to pay a duty of 20 fr. and 15 fr. per ton under the maximum and minimum tariffs, respectively.

The effect of the new Austrian tariff, on the other hand, will be to reduce the iron and steel duties in several important particulars. The lately negotiated customs treaty between Austria, Germany and Italy provides that the duty in pig iron imported into Austria, which is now eight florins (Austrian) per ton, will be reduced from February 1 next to 6½ florins, and as the duties are payable in gold, this means a reduction of 73 cents per ton. Bar iron is likewise reduced 24 cents per ton; while duties on hardware will be lowered from 15 to 20 per cent. As Austria has a "most-favored nation" treaty with Great Britain, the latter country will participate in the advantages afforded foreign manufacturers in the new arrangement.

ALL-STEEL, NICKEL-STEEL OR COPPER-STEEL?

Upon no one question is the attention of the iron and steel world more intently concentrated at present than upon the production of the highest form of armor plate. English, French and American steel manufacturers are making history, these days, and the outcome of it all will be a marked advance in the art of modern warfare. Recent tests, both at home and abroad, have shown results of the utmost importance and are worthy record. Three distinct lines of development seem to be going on. The best product of American steel works seems to be the Harveyized nickel-steel; the most remarkable results so far obtained in England have been from all-steel armor, while the French manufacturers appear to be directing their effects toward the production of cupreous steel.

The Harveyized nickel-steel comes with the prestige of a most successful series of tests near Washington and the official endorsement of our Navy Department. The treatment of the high-carbon nickel-steel by the Harvey process is as follows: The armor plate of ordinary mild steel is laid, perfectly flat-wise, upon a bed of dry sand or clay, deposited upon the bottom of a firebrick cell or compartment erected within the heating chamber of a suitable furnace. The face to be heated is left exposed, and the compartment partly filled with granular carbonaceous material, which having been rammed down upon the plate, is covered with a stratum of sand, upon which is a layer of fire-brick. The furnace is raised to an intense heat, about that required to melt cast iron, which is continued for such a period of time as may be required for the absorption by the metal near the upper surface of the plate of an additional one per cent. more or less, of carbon, by virtue of which the surface metal acquires the capacity of hardening. After carbonization is complete, the plate is taken from the furnace, and, without removing the carbonaceous material from its surface, is allowed to cool down to a proper temperature for chilling. During cooling, the carbonaceous covering protects the metal and prevents the formation of scale, which, if present, could prevent proper hardening of the metal beneath it. When the metal has cooled to a dull cherry-red, it is plunged into water for chilling or tempering, the result being a hard face with a tough backing. The plate thus produced stood the severest tests at the recent trials, but the results are by no means considered conclusive as to the Harvey method, and still further tests will be made, at an early date, of high-carbon nickel-steel with or without the treatment above described. While nickel-steel appears to be held in highest favor by our naval officials at present, it is not without its critics, and it is stated that a ship of war built in this temperate climate of ordinary steel, and clad with say 3,000 tons of nickel-steel armor, would be destroyed by a visit to the Arctic regions, owing to the contraction of steel by the extreme low temperature.

While these noteworthy experiments are taking place in the United States, the English Admiralty have been achieving some quite as remarkable results with all-steel plates. In a recent test, wherein the ordeal to which these plates were subjected was exceptionally severe (consisting of five rounds from a six-inch breech-loader at a range of ten yards, with 100-pound chilled shot), the projectiles rebounded from the same or were shattered, while the plate was not only free from penetration but failed to show so much as a crack. Our American experimenters will no doubt take due note of this.

With the Bethlehem and Pittsburgh people carrying forward their tests in the United States, and the Cammels in England, the Schneiders in France have by no means been idle. Recent important patents have been granted them by the French government for a new process of manufacturing cupreous pig iron and cupreous steel, the end reached being the production of armor plates showing very remarkable qualities of elasticity, resistance, and malleability. To manufacture cupreous steel, either in the crucible or by the open-hearth process, either ordinary copper or cupreous pig is employed, avoiding, in the manufacture by the open-hearth process, oxidation of the copper before it is alloyed with the steel. This result is obtained by introducing the cupreous pig or the copper, either at the beginning of the fusion into the interior of the bath which is protected by the layer of slag, or at the end at the moment of adding the recarbonizers. This process is applied to all the existing methods of manufacturing steel in the crucible or on the open hearth.

Here is, indeed, an international contest of intellect in peace for the highest forms of resistant material in war, and may the results redound to the spread of peace and good will throughout the world.

CLEVELAND'S vessel interest is growing with each succeeding year. During the year 1891, 33 craft of all kinds were built in our extensive yards. These included seven magnificent steel propellers, four of which were under, and three over, 2,000 tons gross tonnage. The total tonnage for the Cuyahoga customs district is now 274 vessels, with an aggregate gross tonnage of 212,788.52 and a net tonnage of 178,833 14. Of these, 24 are iron and steel vessels, with an aggregate tonnage of 50,488.55. The figures also include 142 steam vessels, of wood, with a total gross tonnage of 110,686.30.

SPIRIT OF THE TRADE PRESS.

WHAT THE FOREIGN PAPERS ARE SAYING.

Electricity in Drilling Metals.

"The Application of Electricity to the Drilling of Metals" formed the subject of an instructive essay which was read at a recent meeting of the Institution of Engineers and Shipbuilders in Scotland (Glasgow Section), by Mr. Sinclair Couper.—[Glasgow Engineer.

Making a Locomotive in Ten Hours.

A six-wheel coupled engine and tender has just been built at the Stratford works of the Great Eastern Railway in ten working hours. The best similar performance hitherto was by the London & Northwestern Co., who erected an engine and tender in 25 hours.—[Glasgow Engineer.

The Sheet Iron Trade in Southern Russia.

Until quite recently nothing but fine iron sheets were used for covering houses in Southern Russia. This system of roofing is beginning to be abandoned in favor of tiles. A large number of tile works have been established in the southern regions of Russia and Caucasia. This sudden hange, added to the increase of the import duties on fine sheets, will inev tably result in further restricting the import of that article.—[Iron and Coal rades Review, London.

New Method of Straightening Steel Plates.

Herr E. Stridsberg, engineer, of Gullofors Factory, Trollhattan, Sweden, has patented a method for straightening steel plates, etc., without hammering, which latter may have an injurious effect on the metal. The heated plate is plunged into the hardening bath, but is not allowed to remain there until quite cold as heretofore. When the temperature is somewhat lowered it is taken out and placed between two cold discs in a hydraulic press, which is then screwed down.

Anything but the Tariff.

The editor of the *Iron and Steel Trades Journal* (London) can see no earthly good in our American system of protection, but he is gracious enough to admit that we have an era of great prosperity before us in 1892. Hear him: Though the course of British trade in the coming year is still shrouded in uncertainty, we can, without fear of fallacy, predict a period of great prosperity in the great Transatlantic Republic. The good things in store for the Americans in 1892 we do not begrudge them, although we cannot expect to participate to the full as we did in by-gone days in the prosperity of the States. Already our grain and cotton accounts with American shippers largely exceed the trade of last year; but the effect of the American surplus, opportunely occurring concurrently with a failure of crops in Russia and Roumania, will be still more apparent in 1892. The events to follow the new tariff, though arising from strictly natural causes, will, undoubtedly, be attributed by the McKinleyites to their unnatural fiscal policy. A small boy throwing stones in the ocean, might attribute the subsequent occurrence of a great storm, to his puny efforts. Captain Cook's astronomical knowledge enabled him to hoodwink the South Sea Islanders, and we shall be surprised if the supporters of high tariffs do not claim the coming prosperity as the result of their efforts. Two hundred years ago, Captain Cook had as much control over the sun as the American politicians have to-day, but the American farmers are better educated than the South Sea Islanders, and ought to draw fairly straight lines between effects and their causes.

Mr. Maxim's Wonderful Engine.

We have referred on one or two previous occasions to the interesting experiments which Mr. Maxim, the well-known inventor of the automatic gun, is conducting near London, with a view to solve, if possible, the difficulties that have hitherto prevented man from claiming the empire of the air which he at present possesses on land and sea. That Mr. Maxim is no blind enthusiast it is scarcely necessary to say. He has approached the question he has set himself in a searching and analytical spirit, which might be expected of so talented a mechanician, and with a painstaking perseverance which excites great interest in scientific circles in respect to the actual trial of his ærophone, which is shortly promised. Speaking at the annual meeting of the Æronautical Society, a few days ago, he vouchsafed some particulars with regard to the motor which he has designed to actuate his flying machine, that afford some clue to the care and thought he has devoted to the problem, and which indicate that he has, in one direction at least, made great advance on the efforts of previous workers in this field. The steam engine which he is employing is so highly developed and carefully designed that he assured his audience he could obtain a brake horse-power for each 10 lbs. of weight of engine, boiler and condenser. This, as Sir James Douglas remarked, is a remarkable attainment, and means nothing nothing more or less than the equivalent to the strength of a full-grown man being exerted by a piece of mechanism weighing but 1½ lbs. at most.—[Practical Engineer, London.

PROGRESS OF THE SOUTH IN 1891.

Certainly an Imposing Summary.

The year 1891 has not been a period of uninterrupted prosperity for any section of the country, but it has resulted in immeasurable benefit to the South. During 1891 the South completed 28 blast furnaces, ten rolling mills, one Bessemer steel rail mill in Maryland and one Bessemer plant in Kentucky, and nearly finished two cotton-tie mills and one tinplate mill, and is about ready to commence building another tinplate and steel mill. Its production of pig iron was 1,900,000 tons, and of coal 23,000,000 tons. The assessed value of property increased to $4,800,000,000, a gain of $320,000,000 over 1890, and of $1,900,000,000 over 1880. The corn crop was the largest ever produced, being about 568,000,000 bushels, a gain of 117,000,000 bushels over 1890, while the gain in wheat was 16,000,000 bushels. The foreign trade of 1891 was the largest the South ever had, the total value of the exports for the 11 months ended November 30 having been $296,500,000, an increase of $28,000,000 over the corresponding time of 1890. The imports at Southern ports for the same period showed an increase of $9,600,000, although the total imports for the whole country declined about $4,000,000, or a net decline outside of the South of $13,000,000. In November the exports from the entire country were valued at $110,000,000, and of this amount nearly one-half, or $53,300,000, was from Southern ports.—[Manufacturers' Record.

Advantages of Steel-Making in the South.

As has been demonstrated, steel can be made in the South of excellent quality, by the acid process, and more so by the basic and duplex process. As far as the cost is concerned I am convinced that billets of superior quality, below 1.070 phosphorus can be made at various points from Southwestern Virginia down to Birmingham, Ala. Such billets would bring $28 per ton at the mill, at a cost of $24 per ton at the present demoralized market, when ordinary Bessemer billets sell at $24 to $25 at Pittsburgh, Pa.—[G. L. Lentschler, in The Tradesman.

Diversifying Industries—A Lesson from the North.

A manufacturing center must grow; it cannot be made. The great concerns in the Central North have been developed from mere shops, the owners of which had but a few hundred dollars to begin with. Thus grew up the enormous agricultural implement trade at Canton, Massillon, Akron and Springfield, O., and the equally big ones in Minnesota. Forty years ago the whole of those in Ohio, now employing not less than $30,000,000 capital, didn't command that many thousands. The Studebaker Wagon Works, one of the greatest in the world, began thirty-five years ago in two frame shops, one story each. It now has sixty acres floor space, works a thousand mechanics and laborers, uses $5,000,000 capital and makes $10,000,000 value yearly output. There are a great many articles the South is peculiarly adapted to produce. We can make our own shears, drawing-knives, all forms of plain tools for the mechanic, farmer, quarryman and woodsman. No great capital is needed in these lines to give them a fair and favorable start. We are now producing an excellently adapted steel for cutlery, springs, etc.; also as good boiler material as the world can show. Let us not wait to start at the top. Begin at the bottom and grow.—[Tradesman.

How the South Stood the Financial Strain.

The South, though less fortunate than the other quarters of the country, stood the strain wonderfully, during the squeeze of the first half of the year just ended. There have been compartively few failures in spite of the low price of cotton. The 6,000,000 bales of the crop of '91 sold already, has pretty well evened accounts with the bank, storekeeper and factor. The two million bales remaining, held by the producers who are able to hold, is worth now $70,000,000. It will be sold for that much before May 1. The money it will be exchanged for will nearly all remain in the South. Meantime accumulated stocks of iron and the current product will be worked off and this will serve to keep things going in the iron region. Furnaces now in blast are generally out of debt. The money the masters get will be paid out here for labor, coke, ore, etc. An advance of a dollar on the ton may be realized early in the year, if it is a good deal of life will be put into general trade.

We figure the general basis for the support of better commerce like this:

IN THE SOUTH.

Cotton unsold	$70,000,000
Iron	5,000,000
Lumber	15,000,000
Total for South	$90,000,000

These industries have paid off the Eastern creditors for debts made last Winter and Spring; what comes from the residue will stay.

IN THE NORTH.

Wheat unsold	$90,000,000
Corn unsold	70,000,000
Hay, etc., unsold	20,000,000

This is a grand total of $300,000,000, on a rough estimate, upon which we rely for a return of confidence in solid objects of investment.—[The Tradesman, Chattanooga.

BACKWARD AND FORWARD LOOKS AT THE IRON TRADE.

A Big Volume but Unsatisfactory Prices.

It rarely happens that prices have shown as little change as during the year now closing. The tendency has been almost uniformly toward a lower range, yet the loss in no case exceeded 5 per cent., and in pig iron hardly as much as that. This is the more surprising when we consider the fact that the closing month of the year shows an increase in the output compared with the opening month equivalent to more than 1,000,000 tons per annum. Statistics in regard to stock on hand are not immediately available, but if prices are any criterion there is no reason to suppose that there is any very important increase, although, of course, there is some. Prices during the last month of the year were steadier than at any time, since midsummer, which is a pretty good reason for believing that stocks are not greatly out of proportion with the increased output. Half a million of tons on a production of 4,000,000 or 5,000,000 tons would be quite as much or more than 1,000,000 or 1,250,000 would be on the present output, so that even if there is that quantity on hand it need cause no uneasiness, as it simply represents six or eight weeks' consumption. Nevertheless 1891 has been unprofitable and trying to manufacturers, and with such an experience fresh in mind it seems paradoxical to talk hopefully of the position. But if the enormous production is taken into account, the wonder will be that it has been absorbed with but a very trifling shrinkage in prices. The output must have been very close to 9,500,000 tons, and with a decreased consumption of nearly 1,000,000 tons at the rail mills, compared with

some former years, it is evident that whatever the pecuniary result may have been to producers the volume has been enormous.—[Iron Age.

Railroad Building in 1891.

Following is a table of the new mileage by States for 1891:

Alabama	175.1	Oklohama	5.7
Arkansas	68.5	Oregon	53.8
California	151	Pennsylvania	241.7
Colorado	147.1	Rhode Island	4
Florida	55	South Carolina	189.5
Georgia	212	South Dakota	92.1
Idaho	20.4	Tennessee	165.7
Illinois	68	Texas	158.2
Indiana	17.6	Utah	79
Iowa	28.4	Vermont	19.5
Kansas	1.4	Virginia	182
Kentucky	39.5	Washington	232.2
Louisiana	158.4	West Virginia	191.2
Maine	6	Wisconsin	111.9
Maryland	3	Wyoming	50.4
Massachusetts	7.8		
Michigan	97.4	Total United States	4,011.5
Minnesota	111.6	Alberta	151.5
Missouri	41.2	British Columbia	67
Montana	186.2	Manitoba	90
Nebraska	45	New Brunswick	21.5
New Hampshire	10.5	Nova Scotia	7
New Jersey	57.5	Ontario	70.3
New Mexico	19.5	Quebec	55
New York	164.3	Mexico	330.9
North Carolina	105.9		
North Dakota	101.3	Total Foreign	823.2
Ohio	131.7	Grand total	4,818

The total for the year was the least since 1885. In fact, since 1878 there have been but two years, 1884 and 1885, when so little railroad has been built as in 1891.—[Railroad Gazette.

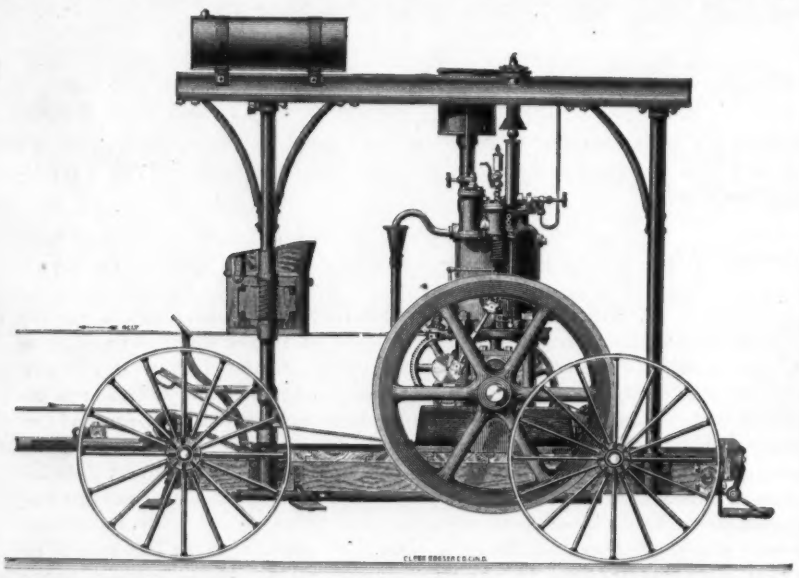
An Exceptionally Reassuring Outlook.

Taken as a whole the railroad situation may be said to be more promising than at any time within the past five years, or since the act to regulate commerce took effect. With the passage of that act came a new era in the railways of the United States, and that such a change of methods and operation as was necessitated by the passage of that act could have been accomplished with so little disturbance as has actually been the case, speaks volumes for the ability and conservativeness of the managers who have had the matter in charge. We believe that the coming year will show a marked improvement in this regard, and feel confident that on the first of January, 1893, we shall have a still further advance in this direction to record.—[Railway Review.

A NEW PORTABLE GASOLINE ENGINE.

The illustration shown herewith represents a view of the latest departure in motive power for portable purposes, and in the outcome of years of careful study and experiment it is the Van Duzen portable gasoline engine. As will be seen, it is of the vertical type, reducing to a minimum the friction as a perfect aligment is obtained. The cylinder is supported by four steel standards accurately turned and finished, which are screwed in the base. These standards also support the shaft operating the valves, which are all poppet valves, owing to the slide valves grinding up, thereby obviating the necessity of taking them out and cleaning them. These engines do the same work as any portable engine at a much less cost, running on one-tenth of a gallon of gasoline an hour for each horse-power—a ten horse-power will run one hour on one gallon. As there is no engineer or fireman needed, no water to haul, wood or coal used, it can readily be seen to be an economical machine to operate, also much safer, as an explosion is an impossibility.

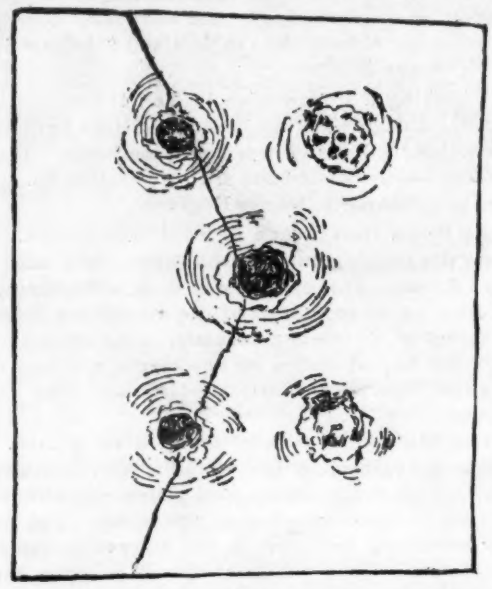
The governor has complete control of the valve admitting the gas to the cylinder and none is admitted, except as the load on the engine calls for it; this keeps the speed of the engine at one continual thing. By a very simple



device the speed can be immediately reduced from 200 to 70 revolutions per minute, and continue to run at that until otherwise desired. The pulley is so constructed that it can be stopped instantly, but the engine continues to run. This is a feature that will be readily appreciated by those who have handled portable steam engines, as the machinery they are running sometimes becomes disabled and, owing to the momentum of the engine, it is impossible to stop quick enough, hence the damage is much greater than it might have been if they could have stopped instantly. For further particulars and prices address the manufacturers, the Van Duzen Gas & Gasoline Co., No. 25 Broadway, Cincinnati, O.

RECENT TESTS OF AMERICAN ARMOR PLATE.

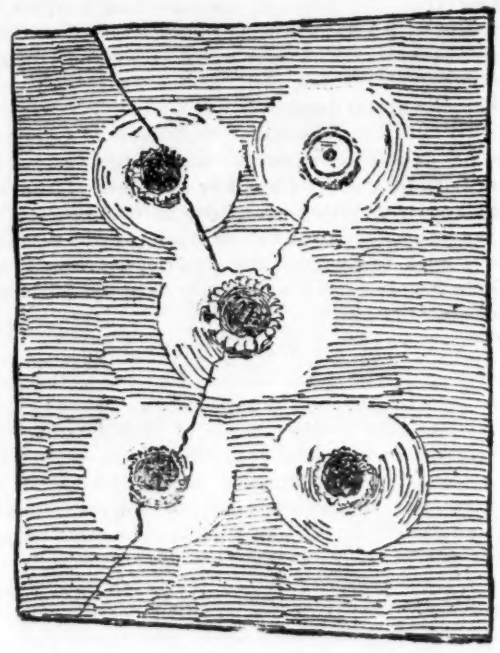
"By far the most momentous question which the Department has had to consider in connection with the construction of the new Navy is that of armor; first, to secure a supply of American manufacture; and, secondly, to determine what kind of armor should be adopted, having reference both to its composi-



TARGET NO. 1.

tion and mode of treatment." This paragraph is quoted from Secretary Tracy's report submitted to Congress on the first day of the present session. The "armor" is applied to the metallic protection of ships which the increased power of modern artillery has made necessary, the ultimate object being to attain the greatest amount of protective power with the least possible weight. But the number of manufacturers of armor is exceedingly limited in consequence of the cost of plant and the skill and experience required. * * *

The great competitive trial in September, 1890, at the Annapolis Proving Ground, of three armor plates—one of steel and one of nickel steel, manufactured at La Creusot, France, and of a compound plate manufactured at



TARGET NO. 2.

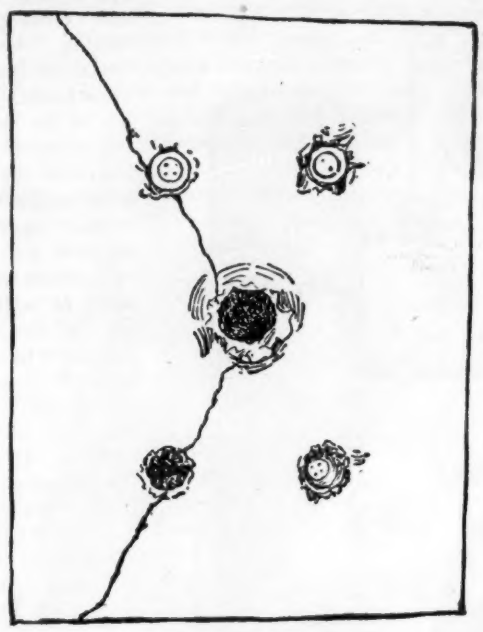
Sheffield, England, was the most important contest of guns against armor ever known before on this continent, and one of the most important ever held anywhere, not excepting the one at Ochta, Russia, in November following. It had been the talk of Europe as well as America, and it has made the Annapolis Proving Grounds familiar in discussion, like Spezia, Portsmouth, Shoeburyness, Gavres, Ochta and other places where tests have been made. The results were uniformly excellent. As far as resistance to penetration is concerned, no steel or compound plate had ever equaled the nickel-steel plate tested at Ochta. The Annapolis nickel-steel plate did not possess the hardness of that at Ochta, but it showed a tenacity never before evidenced by any plate, and that, too, with an absence of brittleness which enables it to withstand its tremendous punishment from the 100-pound 17¾ inches long steel-pointed projectiles from the eight-inch breech-loading rifles, without a crack of any description. It showed less liability to be broken up by continuous fire than ever before noticed in any plate.

Since then other valuable tests, both of plates and projectiles, have been held on the Annapolis Proving Grounds, and also at the new proving grounds at Indian Head. The recent tests of armor plates at the latter range by the Board, of which Rear-Admiral L. A. Kimberly is president, furnishes data which is considered by the Navy Department as quite sufficient to determine the policy to be pursued in the manufacture of armor for practical use on the ships undergoing construction. It seems, therefore, that there will be no further delay of the work on the new vessels because of lack of armor. After

careful consideration of the results of the firing upon the six plates, it was the unanimous decision of the Board that they be placed in the following order of merit:

1. The high-carbon nickel-steel Harvey plate furnished by the Bethlehem Iron Co.
2. The high-carbon nickel-steel plate furnished by the Bethlehem Iron Co.
3. The high-carbon nickel plate furnished by Carnegie & Co.
4. The low-carbon nickel-steel Harvey plate furnished by Carnegie & Co.
5. The low-carbon nickel-plate furnished by Carnegie & Co.
6. The low-carbon steel Harvey plate furnished by the Bethlehem Co.

The right side of plate No. 1 showed remarkable qualities. The two projectiles which struck that side penetrated not more than seven inches, the head remaining in that plate, completely filling the hole, and with the appearance of having been welded to the surrounding metals, while the body was shattered into many fragments. The Board was of the unanimous opinion that plates Nos. 1 and 2 are superior to the Creusot steel and nickel-steel plates of last year's test. In closing, the Board said: "It will be noticed that the

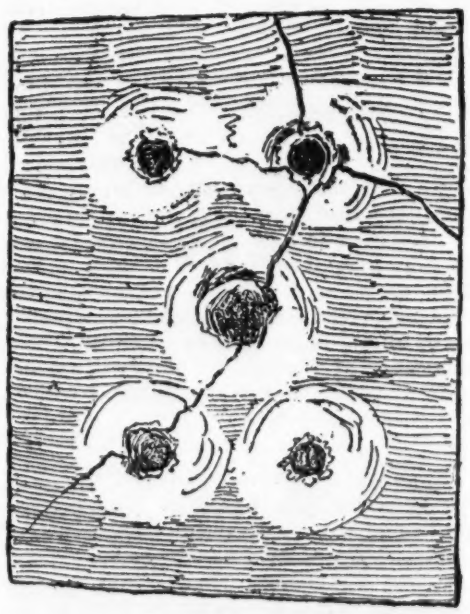


TARGET NO. 3.

high-carbon plates show better results than those of low carbon, but it is believed that the chemical analysis of the plate now in progress will show that the words 'high' and 'low,' employed by the manufacturers, have been used arbitrarily, and have but little value for purposes of comparison."

The Navy Department has since decided to go on with the manufacture of the high-carbon nickel-steel plates, or the plates which have been treated by the Harvey process of surface hardening.

But the work of obtaining the best armor plate by competitive tests is not finished, and the ordnance officers will continue with the further development of the Harvey process of surface hardening. Aside from the Harvey process the treatment given to the metal of the Bethlehem Works is entirely different from that given to it by the Carnegie Works, and the trials were competitive tests of the two methods. Pending its further development to secure uniformity and economy in the methods of treatment, the Navy Department has authorized both the Bethlehem and the Carnegie firms to go on at once with



TARGET NO. 4.

the manufacture of high-carbon nickel-steel plates, as no other plate for side armor has yet proved so successful a match against the 6-inch projectile that may be fired under the most extreme conditions. The total armor required for the twenty-two vessels now building is 15,945.85 tons. * * *

The appliances at the proving grounds are of the most modern kind, including electrical apparatus and instruments for determining the speed and force of the projectiles, bomb proofs, and a large traveling railway crane for handling heavy guns.

The cuts given herewith represent four only of the six armor plates used in the trials at Indian Head, on October 31 and November 14. The plates were subjected to tests more severe than had ever been applied at any foreign Government trials, and the results showed conclusively that the best of the plates, or No. 1, is superior to any foreign plate yet produced, and that Nos. 2 and 3 made records which compare favorably with the best. Four shots, one at each corner, were fired at each plate from the 6-inch gun, with an impact velocity of 2,075 feet a second, and an energy of 2,988 foot-tons, using the Holtzer projectile of 100 pounds. One shot was then fired at the centre of each plate from an 8-inch gun, with an impact energy of 4,988 foot-tons, using Firming and Carpenter projectiles of 210 and 250 pounds weight, respectively.

The right side of plate No. 1, the high-carbon nickel steel plate, tempered by the Harvey process and furnished by the Bethlehem Co., showed very remarkable qualities. The two projectiles which struck the right side penetrated not more than seven inches, the head remaining in the plate, completely filling the hole, and with the appearance of having been welded to the surrounding metal, while the body of the shell was shattered into many fragments. There were no cracks made on that side of the plate; and the back of the plate, on the right side, showed no disturbance except a hardly noticeable swelling on the surface. The first shot fired at the upper left-hand corner was smashed without doing any damage to the plate beyond eight inches penetration, the point of the shell remaining imbedded. The shot fired at the centre and the one at its lower right-hand corner on October 31 met less resistance. The shot into the lower right-hand corner got in to a considerable depth. The reason for this was the inequality in the tempering of the plate, the lower part not being treated with the tempering process.

Plate No. 2, the high-carbon nickel steel, from the Bethlehem Works, showed a great degree of uniformity as well as resistance to penetration.

The small penetration of the 8-inch shot, the one in the centre of plate No. 3, on November 14, was, in the opinion of the Board, due to the excessive upsetting of the projectile. This plate was of high-carbon nickel steel from the Carnegie, Phipps & Co.'s works.

Plate No. 4, a low-carbon nickel steel, Harveyed, from the Carnegie works, lacked in all of those characteristic qualities possessed by the right side of plate No. 1. It was perforated clean through by one of the projectiles, while Nos. 1, 2 and 3 kept out all of the projectiles. All of the armor plates were more or less cracked through, but only two, Nos. 3 and 6, badly, and these two plates alone showed cracking before the fifth shot, the one with the 8-inch projectile. It is observed that the "high carbon" plates show better results than the "low carbon," but it is believed that the chemical analysis of the plates now in progress will show that the words "high" and "low" employed by the manufacturers have been used arbitrarily and have little value for purposes of comparison.—[New York Tribune.

A FAMOUS MINE CLOSED.

The old Dickerson iron mine, located at Mine Hill, N. Y., one of the oldest in the country, has been finally abandoned, owing to the unprofitable working of the mine at the depth reached. This mine has been worked almost constantly for about 175 years, and the vertical shaft has been sunk to a depth of over 1,000 feet.

There is quite an interesting history connected with this old mine. The land above and around the mine was taken up as a mining tract in 1716 by John Reading, surveyor-general of the State, for Joseph Kirkbridge, who bequeathed it to his three sons. The first ore from the tract was worked from pockets at the surface, and was carried in saddlebags to Elizabeth, where it was made into bar iron, to be transported on horseback to a market. During the Revolution ore from the mine was converted into cannon balls for the use of Gen. Washington's little band of fighters. The Dickerson family began to get possession of the mine in 1780, and in 1838 Gov. Dickerson was shipping ore by the Morris Canal to Pennsylvania furnaces. Before that period the mine was worked under the system of forge rights. The owner of a forge or forge fire, who had an interest in the mine, would go to Mine Hill and get out for himself all the ore he needed. Mining was easy enough, for the ore cropped out from the surface in large quantities. Its Indian name was Succasunna, or Zukkazuing, "place of the black stone."

During the days of forge rights the ore was carted to northern New Jersey to supply 100 or more forges. As legal tender was a scarce commodity in those times, the 30 or 40 forgemen who worked at Mine Hill paid for the raw material with bar iron brought back from the furnaces or forges, and thus the Dickerson mine became a commercial centre for crude and manufactured iron.

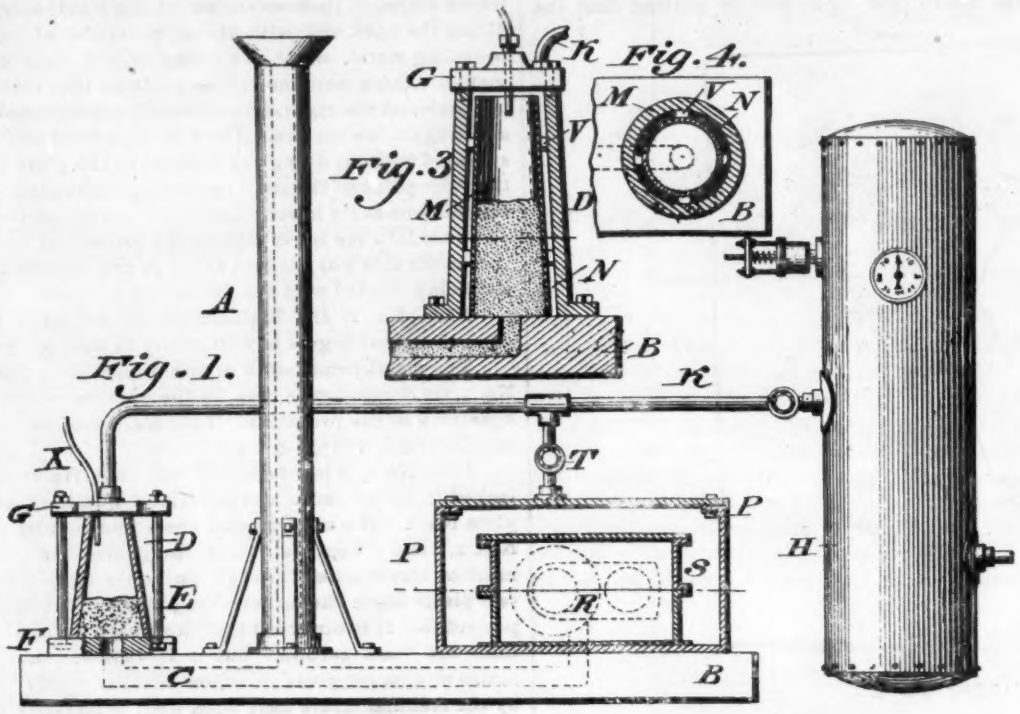
After Gov. Dickerson's death in 1853 the property was controlled by his nephews and nieces, but in 1860 business was so poor that they ceased working it, with a pile of 25,000 tons, then an enormous quantity, on the bank. Subsequently the mine was leased, new machinery was put in, and a boom was expected. Two years ago, however, an offset in the bottom of the mine threw the vein off so that it became lean and rocky and unprofitable. The mine produced about 1,000,000 tons of exceptionally fine ore.

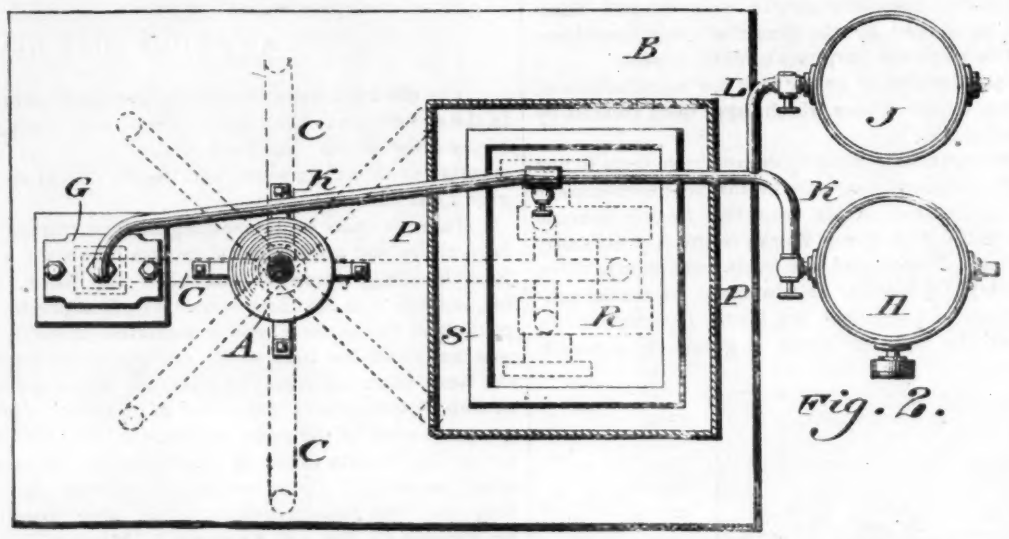
THE remarkable development of the nickel-mining industry in Canada is one of the marvels in the recent history of mining. In 1889 there was but one company producing in the Sudbury district, and in the following year the output exceeded 1,000,000 pounds of nickel, surpassing the output of the famous mines of New Caledonia. With these two deposits of nickel, both of which are of vast extent and contain ore of high grade, there is evidently no danger that the demand for nickel will outstrip the supply.—[Engineering and Mining Journal.

FEREOSTATIC COMPRESSED STEEL CASTINGS.

The object of this improved method of making compressed steel castings is to keep a contant and uniform pressure on the fluid metal so as to prevent the raising and boiling action which accompanies the pouring of melted steel into ingot or sand molds, and thus prevent the forming of blow holes and honeycombs which are found more or less in all steel castings. As may be understood from the drawings the melted steel is poured into the molds through a high runner connected to molds in which a pressure is constantly maintained to counterbalance the weight of the fluid steel in the runner. This pressure may in all ordinary cases be from 40 to 70 lbs. per square inch, and, as the pressure is constantly pressing on the metal run into the molds, each layer becomes pressed and forced down and thus prevents the forming of blowholes and cavities, at the same time making the steel casting more close grained, sound and far superior to unpressed casting.

Comparing this method of compressing steel with hydraulic pressure, and bearing in mind that the useful effect of compression in hydraulic ingot molds is proportional to the depth of mass or ingot, (not taking into account the enormous friction and loss of effect caused by the chilled sides of the ingot, which must be crushed before any useful compression reaches the centre), and taking this pressure to be 8,000 lbs. per square inch on a 12′ ingot and taking ⅛″ depth in closed mold, we have the pressure in this to be equal to (8,000x⅛) ÷ (12x8) = 10.4 lbs., while it always is 40 lbs. per inch. Furthermore, the work done by compression in closed molds is gradually from the bottom up on each layer or particle as it is poured in. This method of compression is equally applicable to sand molds for castings, for machine beds, fly-wheels, gears, cylinders, crank shafts and propellers. The appliances required for casting under this method are inexpensive and of the simplest kind, and cannot fail to increase the strength of the castings.





In our illustrations, Fig. 1 represents a partly side and partly sectional view in elevation of an apparatus for casting steel. Fig. 2 represents a plan view of the apparatus shown in Fig. 1, parts being in section. Fig. 3 represents a view of a mold for casting large ingots. Fig. 4 represents a section on line *x x*, Fig. 3.

Referring to the drawings, A designates a runner of any suitable height, firmly secured to a base B, the latter having therein the ducts C, leading from said runner into an opening in the base of the frame of the ingot-mold D. The frame E of the said mold is formed of a base F and a cover-plate G, which inclose the ends of the mold D and are firmly secured by bolts having their ends inserted in openings in said base and plate, having nuts thereon.

H and J represent, respectively, low and high pressure compressed air or steam receivers having the pipes K and L leading therefrom, the pipe K leading into the top of the mold D and the pipe L into the pipe K. Each of the pipes K and L is provided with a stop-cock, so that the air or steam supply can be shut off from either receiver, as desired.

For casting large ingots, the mold D is formed with an inner yielding or flexible shell M, as shown in Fig. 3, the latter having a surrounding space N, communicating with the air or steam supply, the said shell being kept in place by the clay plugs V, located between the shell and outer casing of the mold.

P designates an air-tight box having an opening in its base for the entrance of a duct C to the interior of a sand mold R in the flask S in said box. A pipe T, connected with the pipe K, leads into the box P, and the flask S, which is of the usual construction, has an opening leading into the top of the interior of the sand mold. Any number of ducts may be made in the base leading from the runner A and molds connected therewith, if desired.

To ascertain the height in the mold that is necessary to be filled with metal, a small pipe X is passed through the cover-plate, so that its lower end is at the desired height in the mold. During the filling a current of air or steam will pass out through the pipe; but when the metal has reached the desired height the opening in the lower end of the pipe will be closed, so the supply to the runner can then be stopped.

The operation is as follows: The cock of the receiver J being closed and that of the receiver H opened, the melted metal is poured into the runner A at the top thereof, and, descending, enters a duct C, and from thence passes into the bottom of a mold. The air or steam pressure is regulated according to the pressure of the weight of metal in the runner above that in the mold, so that the pressure on the upper and lower sides of the mass in the mold will be substantially equal, the escape of extra air or steam by the valve V preventing the excess of the air or steam-pressure. The air or steam bears uniformly on the upper face of the metal as it enters the mold, so that the metal is under constant compression the entire time while entering and forming in the mold. When the mold is filled, the air or steam supply from the low-pressure receiver H is shut off, and the cock of the high-pressure receiver J opened, so that a much greater pressure is constantly exerted upon the metal while cooling and solidifying; making a sound and close-grained metal casting free from honeycomb, cavities, pipings, or blow-holes.

In the mold shown in Fig. 3, the air or steam passing into the mold enters also the space N and presses equally upon all sides of the thin and yielding shell M, containing the melted metal as well as upon the top of the metal, thus making a perfect compressed ingot or casting.

In the process herein described when employing a runner of ordinary size, the pressure of air or steam from the low-pressure receiver during the filling of the mold will be about thirty-six pounds to the inch, and when filled the amount of pressure from the high-pressure receiver employed will be about seven hundred to one thousand pounds to the inch.

In the use of the sand mold R the cocks of the pipes K and T are opened and that of the pipe L closed, so that the air or steam from the pipe K and the receiver H enters the mold through the opening in its top at the same time that the metal enters the bottom of the mold, so that the pressure is constantly exerted during the filling of the mold. When the mold is filled, the low-pressure receiver is shut off and the high-pressure receiver is connected with the interior of the mold. The sand mold may be employed at the same time as the ingot-mold, or a number of either ingot or sand molds be operated either separately or conjointly, as desired, however, for the sake of clearness, a single ingot-mold and a single sand mold being shown in the drawings. The runner A is made considerably longer or higher than the mold, so that great air or steam pressure is necessary on the metal in the mold to balance the weight of the metal in the runner above the mold, thus obtaining a heavy pressure on the metal in the mold for compressing the same.

The inventor is Mr. Sorene C. Rockman, of Philadelphia, Pa., and the date of his letters-patent is December 1, 1891.

Americans after Manganese Ore.

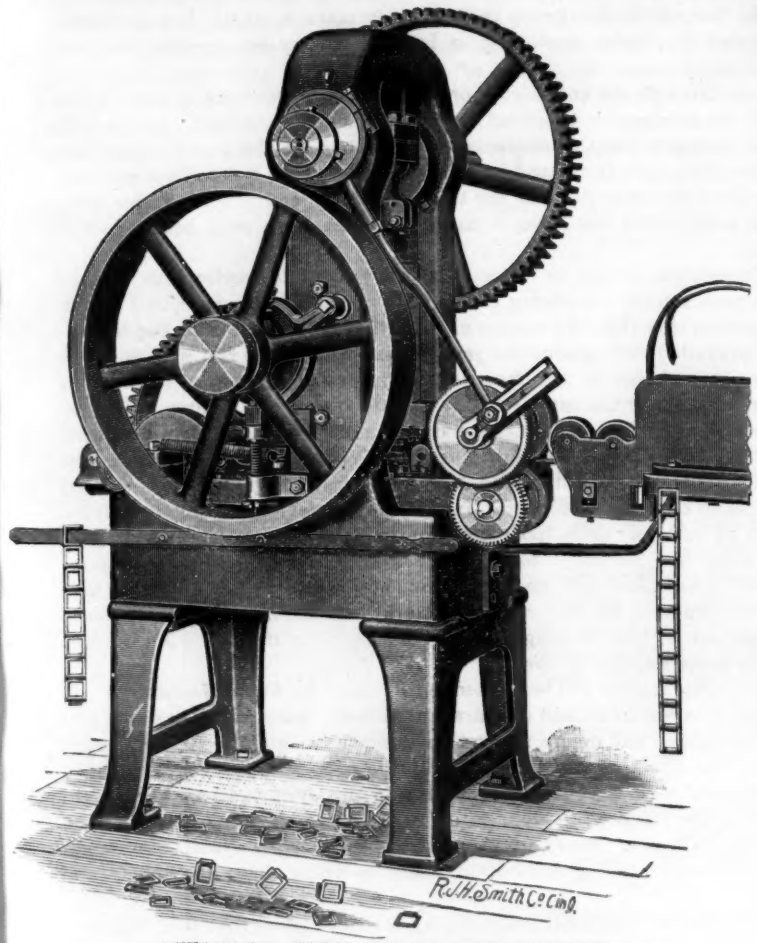
Mr. Howard G. Cope writes from Colon, on the Isthmus of Panama, as follows: "About the 10th of November I met a representative of the Edgar Thomson Steel Works and a man from the Illinois Steel Works, who were down here looking at some manganese mines, near Colon. They must have been favorably impressed, for they have paid $10,000 down for an interest in the mines and will soon commence to work them. I see a big lot of Cambria steel rails for a street-car line going over our road for a Mexican town named Manzanillo. The curves and everything, cars and all, are now crossing here on their way to Mexico."

BASIC slag, which formerly sold in England for 60 cents a ton, now brings $6.08 per ton, or just a little more than ten times as much.

AUTOMATIC STEEL CHAIN LINK MACHINE.

The accompanying illustration was recently brought out by the Toledo Machine & Tool Co., of Toledo, O., for the manufacture of link belting made from sheet steel. The machine is automatic in its movements throughout, being so built that it is adjustable for different sizes or links. The steel is fed from the roll or coil by an automatic roll feed, bringing the end of the coil about midway on the die when first stroke of press comes down and perforates the link. In the upward movement of slide the stock is again fed forward the space of one link, and in the second downward stroke of slide the link is formed and end turned down, at the same time a ram on back side of machine is forced up against turned end of link, which forms the hook. When slide and ram retract an automatic knockout comes into action which forces link from the dies, at the same time the stock is being fed forward for another link. In this manner it will be noticed that one complete link is made at each stroke of press, after first link has been made, the speed of which is about 40 strokes per minute. Weight of this press is about 7,000 lbs.

This machine was built for manufacturing links patented by Thos. Maxon, and owned by the Dayton Steel Chain Co., of Dayton, O., and press is now in operation by said company. This enterprising concern has had remarkable success since its origination, constantly bringing out new and improved machinery. Their line of presses is now very complete, making almost every style of power press used for manufacturing various kinds of sheet metals. We have been informed that since moving into their present commodious quarters located corner Superior and Oak



AUTOMATIC STEEL CHAIN LINK MACHINE.

streets, where they occupy a fourstory building 120x40 ft., they have been exceedingly crowded with orders for their line of goods. Their prospect for coming year is reported as being very bright, and their presses have given universal satisfaction wherever used.

Pig Iron Prophet Benner Misses it in 1891.

Mr. Benner believes in the periodicity of cycles and that the cycle system is produced by the perihelia [points in the orbits of planets in which they are nearest to the sun] of the planets which affect the earth and all that live and move thereon! Mr. Benner himself remarks that:

"The cycles of eleven years in the price of corn and hogs, 27 years in the price of pig iron, and 54 years in general business cannot be accounted for upon any known theory in the operations of trade. Therefore, we must look elsewhere for a cause and solution of the problem. The cause producing the periodicity and length of these cycles may be found in our solar system!"

Now for some of Mr. Benner's prophecies:

"1890.—Great activity in general business. Iron and stocks advancing and bounding upward from the beginning to the ending of this year. A repetition of the year 1879.

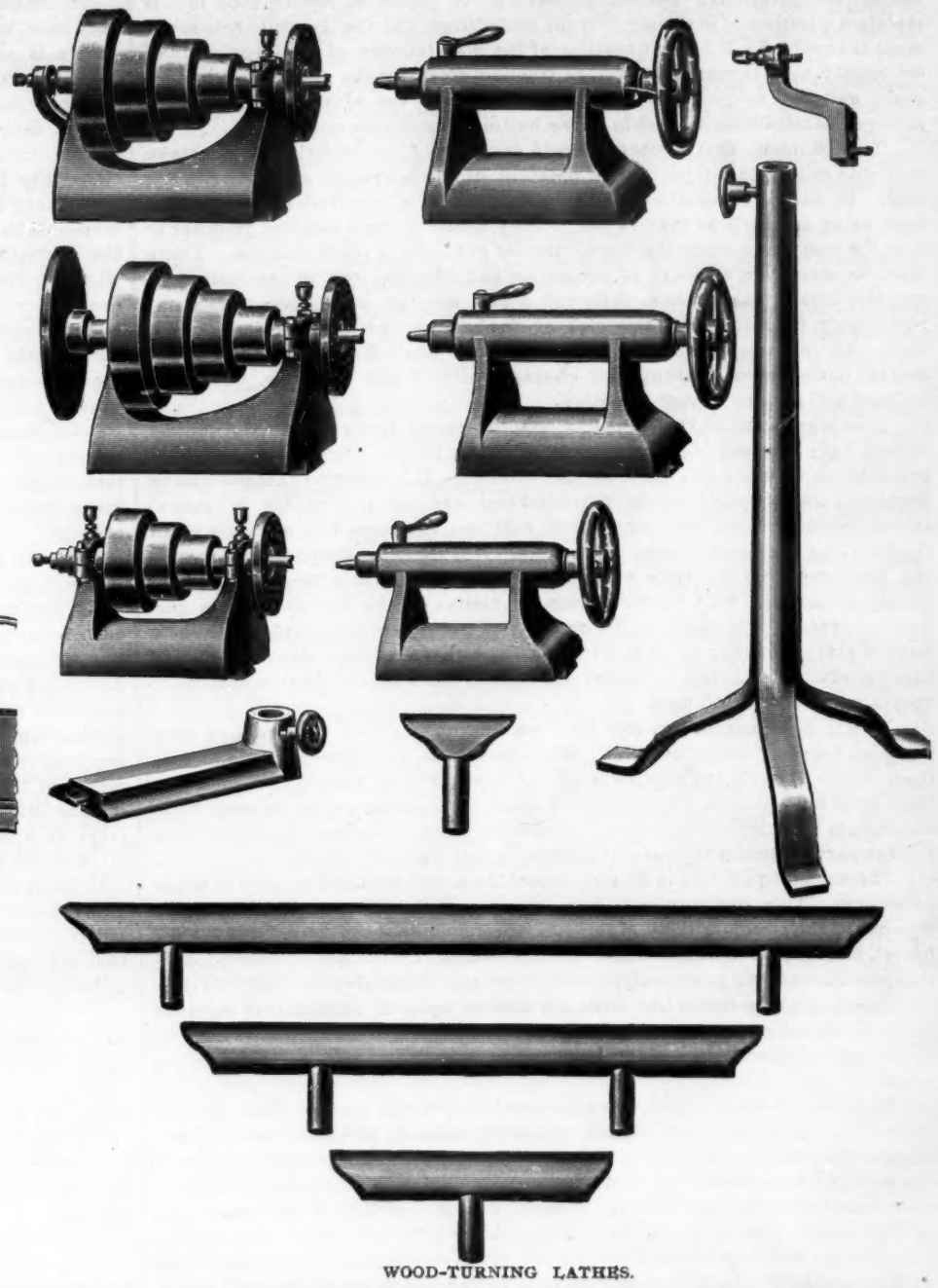
"1891.—This era of speculation and great prosperity comes to a close this year with a panic. A commercial revulsion and general reaction in all business after this year, and down goes trade for a series of years.

"1892, 1893, 1894, 1895, 1896, 1897—Dull years, poor trade."

"He hit part of 1890, but he missed 1891 altogether. We certainly have had no era of prosperity in the iron trade during 1891, and the year is going out without the occurrence of a panic; 1892 is yet to come, and for one, I do not believe that the combined science and prophetic aspirations of Messrs. Totton and Benner enables them to come any closer to the bullseye in foretelling the course of trade, than my knowledge of current events enable me to foretell the character of next year's apple crop, and it is very certain, judging from last season's experience, that buds in April don't count against the possibility of May frosts. No one can fore know these things, but any one can guess at them, and, as guessing is always in order, I will guess that 1892 is going to be a fairly prosperous year, in the iron trade."—["Cold Short" in Ohio Valley Manufacturer.

WOOD-TURNING LATHES.

These wood lathes are made by the Indiana Machine Works, of Fort Wayne, Ind., and are of modern and improved design; the frames are cored



WOOD-TURNING LATHES.

out, making them strong and reliable; they are built in the best possible manner of the best material throughout. They build four sizes, 12, 14, 16 and 18-inch swing. The two first named have iron cones, with three speeds, and the two latter sizes cherry wood cones, with four speeds. The spindles are steel and of large diameter; the bearings are lined with genuine babbitt, and provided with brass oilers. The centres are of improved patterns and very desirable. The 16 and 18-inch may be used also for pattern makers' lathes, in which case they furnish a large face plate at back of headstock, and a floor stand. A countershaft, two centres, four rests and two sockets furnished with each lathe. For further particulars, address the manufacturers.

Diversifying Southern Industries.

It ought to be understood by our own people that the South is not suffering from any cause except her own adherence to crude production, and her overdoing in that line. If Southern legislators and directors of industrial public opinion can, they ought to encourage diversification, first by taxing new plants for making higher product nominally or not at all—for a time; then by patronizing our own foundries, stove makers, house-building materials and the like, when it is as good as can be got in the North. But our Legislatures seem bent on crushing all these new and needed concerns by imposing on them double, or oftener treble taxes. The people will not only, as a rule, buy a stove or plow sooner from the North, but they crave Northern Irish potatoes, and are willing to pay double the price for Northern cottons, towelings, checks, etc., rather than take the superior home product at fair rates. The South, with all her vaunted pride in herself, needs most of all to respect her industries in the only practical way, the way of patronage.—[Tradesman, Chattanooga.

FUEL GAS PROGRESS.

WHAT HAS THUS FAR BEEN ACCOMPLISHED.

In a very readable article in the January issue of the *Engineering Magazine*, entitled "The Newer Forms of Fuel," Mr. Hosea Paul, whose articles in *The Iron Trade Review* on the Ohio natural gas fields attracted such wide attention, refers as follows to the question of producer and liquid fuel:

The production of gas for heating is of comparatively recent date; its processes are incomplete, and the subject far from a finished one, though it has been the subject of upwards of a thousand patents. One need only to visit rolling-mills, furnaces and kilns in different parts of the country to learn that fuel-gas, or as it is generally called, "producer-gas," is already an important and rapidly-increasing factor in metallurgy, pottery, glass making and kindred industrial operations. For steam-making, for instance, the kind of fuel is mainly a question of economy, but for metallurgy and the ceramic arts much more is involved. It is the question of the maintenance of the regulation of the supply, and its ready control, of freedom from smoke particles, injurious gases and the by-products of combustion. The use of producer-gas thus enlarges possibilities and leads to the building up of new arts.

The problem that presents itself in making producer-gas is to make available as large a proportion as possible of the heat-units contained in the coal. To do this successfully considerable range is required in the kinds of coal, using as nearly as may be the quality found in each locality, in order to save the cost of transporting any particular grade from place to place. There must be, moreover, a means of preparing and adapting gas to particular and specific uses; for instance, different kinds may be used successively for metallurgy, for kilns, for steam-making, for heating dwellings and for cooking food. An important practical point is that it shall have by nature or by special device such a strong and characteristic, if not offensive, odor that leakage will at once attract attention.

It is significant of the future of manufactured fuel-gas that the subject should have received so much expert attention in the city of Pittsburgh in competition with the abundant natural product. It is asserted that gas can be made at a cost of two cents per thousand feet, and that a plant for the manufacture of one million feet per day will cost less than one-fifth as much as an illuminating-gas plant of similar capacity. It is likewise stated that the working force required for such a plant is only three men and two boys continuously employed. Still quoting from the claims of the projectors of a gas-making process, it is said that the quantity of gas that it is possible to produce from a given quantity of coal, depends upon the quality of gas desired. Of that variety best adapted for metallurgy the bulk is nearly double that made specially for household uses.

Now if any such claims can be even approached this will make a very cheap and a very convenient fuel. Such cheapness would be possible mainly from turning to account a much larger percentage of heat units than has ever been done before. But because this has not yet been done, or because some statements are a little premature, if not extravagant, it cannot be denied that a great harvest awaits the careful gleaner in this extensive field.

The use of liquid fuel is of very recent date, and confined mainly to crude petroleum. This has long been recognized as a possibility, but was delayed because of the comparatively high price of oil. In 1865 the price was $12 per barrel, but by 1882 it had declined to fifty cents. Up to this time its production was limited to a comparatively small area in Pennsylvania. But the area in which it may be found has widened and in spite of attempts to enhance prices by curtailment of production the supply is so great and comes from so many sources that it is not likely to advance in price materially for many years.

So far as illuminating oil was concerned, few would venture to assert that the world's needs were not already supplied when an immense outfield was developed at Findlay and Lima, in Ohio. In 1885 the existence of such a field was wholly unsuspected, but within two years there was a daily production of more than 20,000 barrels per day. It could not be said that it was needed as an illuminant; it had, moreover, a disagreeable odor not easily removed by the ordinary refining processes. Barred out as an illuminant, manufacturers were sought to try it for fuel, and it rapidly came into extensive use. It did not require any preparation or purification, nor any expensive apparatus. Its use was then mainly a question of price and heating efficiency. As to the latter many scientific and practical tests were made. One made at the North Chicago Rolling Mills, in the Summer of 1887, consisted of burning different kinds of fuel under the boilers used in generating steam in their extensive works and noting the quantity of water evaporated in each instance. The result was that for each pound of Indiana block coal consumed 7.4 pounds of water was evaporated, while a pound of Findlay crude petroleum evaporated 15 2 pounds. Similar results have been attained in many other instances, and their possibility can be shown by chemical analysis. A barrel of oil contains from 260 to 300 pounds, or about seven barrels to the ton, but because its heating value is twice as great we may set down 3½ barrels of oil as equivalent to a ton of coal.

In considering the problem of fuel supply the question and cost of transportation is important. The fuel supply of Boston is derived from Pennsylvania, not less than 300 miles; that of New York, perhaps 150 miles; Philadelphia somewhat less than 100 miles, and Cincinnati and Chicago from points from 100 to 200 miles. The cost of transporting petroleum in bulk in tank cars does not greatly differ from that of coal because of the unavailability of the tank cars for return loads. If the price paid for transportation is three-fourths of a cent per ton per mile, it will cost about 11 cents to haul a barrel 100 miles. If oil can be bought at Lima or Findlay for 30 cents, its net cost at a point a hundred miles distant is 41 cents per barrel, at which price it can compete with coal at $1.44 per ton. At a distance of 300 miles it will cost 63 cents per barrel and compete with coal at $2.21 per ton. The cost of carrying coal is not likely soon to be greatly reduced, while the problem of oil transportation is capable of immense development. When the great oil wells were struck at Pithole, in 1865, the entire yield was drawn off into barrels and hauled in wagons over rough roads to the railroad station at Titusville at a cost for hauling, at one time, of $2 50 per barrel. Now oil is transported to the most distant parts of the world and, barring the artificial restraints of tariffs, sold for less than this. This is mainly possible because of pipe lines. Compared with these in efficiency the tank car is half way to the Pithole mule-team.

POINTS IN THE PIG IRON TRADE IN 1891.

Messrs. Hall Brothers & Co., Louisville, Ky., pig iron commission, write us as follows, under date of December 26:

"Looking backward and reviewing the iron market is comparatively an easy task, as records and experience show for themselves, but to forecast the future is an exceedingly difficult thing to do. The legends of the past are teeming with sufficient illustrative examples to show that no one can prognosticate on the future with any degree of certainty. The circumstances leading to certain conditions and developments one year may not appear at all during the next period, so there can be no special rule to go by, and predictions may be said to be based entirely on hopes or fears from personal interests, either directly or indirectly. The year just closing has been the most remarkable in some respects that history has recorded, and differs widely from the preceding year and is especially noted for the slight variation in prices, which in the line of coke irons has not exceeded $1 per ton, while in 1890 prices declined rapidly, amounting to fully $4.50. Another noticeable feature has been the complete absence of speculation in iron, but this is easily accounted for from the fact of the stringency in the money market, which has prevailed for so long and the banks declining to let out money for speculative purpose.

"Almost through the entire year prices remained about the lowest in the history of the business. Charcoal irons for a while held up in prices with remarkable strength, but this character of metal had all along ruled relatively much higher than coke irons, and in due time the figures had to be materially reduced to meet the exigencies of the time, and have continued to rule very low, and in point of the fact have, in some instances, been sold below cost of production.

"The aggregate of sales in tonnage for the year under review has in most cases been satisfactory, but taking the general markets as a whole, will doubtless fall considerably short by reason of the lethargic condition of the market which has prevailed throughout the year. That prices have run with so much evenness is remarkable in the face of the slow consumption and enormous production, which is at the rate of nearly 10,000,000 tons per annum. The exceptionally fine crops throughout the country, and the known large requirements of the railroads in new eqnipments to move these cereals and other commodities, it was thought would lead to placing orders for an unusually large number of cars, steel rails, etc., and develop great commercial activity, all of which by various causes has been greatly delayed, and as a result general depression has prevailed for a longer time to a greater extent than for many years. The effects of the large crops and other recent influences may assert themselves later on, and revive matters, but the opinion is expressed that the depression that has weighed upon all branches of trade will continue to be felt for some months to come.

"Considerable money will be turned loose about the first of January, which will be seeking investment, and matters will at least temporarily ease up, and doubtless strengthen and open a market for many of the good securities, which have so long lain dormant. The whole situation will, of course, right itself in time, but when the golden lucky morn will gild the gray dawn we know not; but if there is any efficacy in wishes, the heavenly rays would at once shed their welcome radiance. From all exterior appearances we can see nothing that is likely to occur in the immediate future to bring about any substantial advance.

"Probably one of the most encouraging features connected with the iron trade is the fact that the closeness of money matters for many months past has had the happy effect of completely suppressing the boom-town spirit, which prevailed over the country a year and a half ago. In this connection the town boomers' first step was to build an iron furnace as the main support for carrying out their scheme of selling corner lots, sink-holes, etc., to an innocent or credulous public at fabulous prices. This unsubstantial and unhealthy state of affairs ruled so actively for many months as to cause iron furnaces to spring up like mushrooms in some sections, and with no advantages for competing with well established plants. Same were completed and put into operation, while others were nipped early in the action and cut down at the foundation, and there they remain. The plants that have any advantages will eventually fall into the hands of practical operators, and be run on business principles. The experience as a whole has been such that conservatism will prevail in the future, and it is especially gratifying to know that these disturbing elements, not only to the iron interests but to business generally, are things of the past."

Electric Railways.

Russia appears to be ahead of all the world in the project of electric railway building, and such decided advances in a bold undertaking should have abundant reward, as it merits approbation on both sides of the ocean. The proposition is to construct an electric railway from St. Petersburg to Archangel, a well-known port on the White Sea, and a distance of 800 killometers, ro 500 miles. The electric current to be supplied by a series of generating stations, placed at intervals along the entire route. If 500 miles can be covered, why not 1,000 miles, or even across our own continent? Such will be the result before many years.—[Mechanical and Electrical Progress.

AVERAGE MONTHLY PRICES OF IRON AND STEEL IN THE UNITED STATES IN 1891.

In the following table we give from the *Bulletin* of the American Iron and Steel Association, the average monthly prices of ten leading articles of iron and steel in Eastern markets in 1891. The prices named are per gross ton of 2,240 pounds, except for bar iron and nails, which are quoted by the hundred pounds and the keg respectively. It will be noticed that prices were not only very low all through the year, but that they did not greatly vary, the general tendency, however, being steadily downward from January to December, with indications in December of higher prices early in 1892. The monthly averages are obtained from weekly quotations.

Months—1891.	Old iron T rails, at Philadelphia.	No. 1 anthracite foundry pig iron, at Philadelphia.	Gray forge pig iron, at Philadelphia.	Gray forge pig iron, Lake ore mixed, at Pittsburgh.	Bessemer pig iron, at Pittsburgh.	Steel rails, at mills in Pennsylvania.	Best refined bar iron from store at Philadelphia.	All muck bar iron, at Pittsburgh.	Cut nails, at Pittsburgh, (base price.)	Cut nails at Philadelphia, from store.
January	$23 50	$17 50	$14 50	$14 25	$15 95	$29 00	$2 00	$1 80	$1 65	$1 90
February	23 35	17 50	14 50	14 50	16 25	30 00	1 90	1 75	1 65	1 90
March	22 50	17 50	14 75	15 00	16 50	30 00	1 90	1 75	1 65	1 85
April	22 50	17 50	14 75	14 12	16 10	30 00	1 90	1 70	1 60	1 90
May	22 00	17 50	14 75	14 00	15 50	30 00	1 90	1 70	1 55	1 90
June	21 00	17 50	14 75	14 00	16 25	30 00	1 90	1 70	1 55	1 85
July	21 00	17 50	14 60	14 00	16 25	30 00	1 90	1 70	1 55	1 85
August	21 50	17 50	14 50	14 00	16 00	30 00	1 90	1 70	1 55	1 85
September	21 00	17 50	14 35	14 00	15 60	30 00	1 90	1 70	1 55	1 85
October	22 00	17 75	14 35	13 85	15 50	30 00	1 85	1 70	1 60	1 80
November	21 75	17 50	14 25	13 50	15 15	30 00	1 85	1 68	1 55	1 80
December	21 50	17 50	14 25	13 50	15 35	30 00	1 90	1 68	1 55	1 85

AVERAGE YEARLY PRICES OF IRON AND STEEL FROM 1886 TO 1891.

The following table gives the average yearly prices of the articles mentioned in the preceding table from 1886 to 1891, both years inclusive. The prices are per ton of 2,240 pounds, with the exceptions mentioned above. The yearly averages are obtained by averaging the monthly quotations.

Articles.	1886.	1887.	1888.	1889.	1890.	1891.
Old iron T rails, at Philadelphia	$21 42	$22 97	$22 23	$24 19	$25 18	$22 05
No 1 anthracite foundry pig iron at Philadelphia	18 71	20 92	18 88	17 75	18 40	17 52
Gray forge pig iron, at Philadelphia	16 40	17 79	16 21	15 48	15 82	14 52
Gray forge pig iron, Lake Ore mixed, at Pittsburgh	16 58	19 02	15 99	15 37	15 78	14 06
Bessemer pig iron, at Pittsburgh	18 96	21 37	17 38	18 00	18 85	15 95
Steel rails, at mills in Pennsylvania	34 50	37 08	29 83	29 25	31 75	29 92
Best refined bar iron, from store, at Philadelphia	1 92	2 20	2 01	1 94	2 05	1 90
All muck bar iron, at Pittsburgh	1 70	1 95	1 77	1 71	1 85	1 71
Cut nails (base price), at Pittsburgh	2 17	2 15	1 90	1 99	1 99	1 58
Cut nails at Philadelphia, from store	2 27	2 30	2 03	2 00	2 00	1 86

Rolled Iron Bar Tests.

At a meeting of the Engineers' Club of Philadelphia, held December 19th, the secretary read, for Prof. H. W. Spangler, an account of a series of tests upon ¾-inch round rolled iron bars. Ten such bars were taken, and each bar was cut into lengths of about 16 inches each. The first act was tested as it was cut from the bar, and averaged 34,545 pounds elastic and 51,097 pounds ultimate strength. The second set was annealed, and the third was heated to a welding heat and cooled on the floor. The fourth set was upset to 15-16 inches diameter by 2½ inches long. The next set had ends welded on. Another set was cut in two and welded together. Part of another set was prepared in the same way and annealed, and the balance of this set was headed. The last set was also headed in the machine on which the upsetting had been done. The tests show that heating to welding heat and allowing to cool reduced the tenactity 4 per cent., and increased the elongation about 16 per cent. Heating to a cherry red and annealing increased the elongation without reducing the average tensile strength. Upset ends are probably as strong as the original bar. The welded pieces had the same elastic limit as the original bar, but were otherwise greatly inferior, the average tensile strength being about 85 per cent. Annealing had no effect. Headed bars, if without flaws, are as strong as the original bars, but 20 per cent. of the heads were defective.

Chrome Steel.

Chrome steel is made in crucibles, by a re-melting process, from ordinary Norway iron and a given quantity of chromium. The product, which is rolled from ingots in the ordinary round, square and octagon bars, has an insertion of a layer of chrome steel hidden between an inner and outer layer of iron; the combination plates of 5-ply thickness are prepared in the same manner. The completed material is said to be the hardest steel known, and easily resists the drilling, cutting or boring tool of the burglar, hence chrome steel bars and plates are extensively used in making burglar-proof safes and vaults, and in the construction of jails and prisons.

Seeking West Virginia's Coal and Timber.

It is stated by reliable parties that the Columbus, Hocking Valley & Toledo Railroad Co. has under contemplation the extension of their road from Gallipolis, O., to Kenova, W. Va. The company will probably build down the river to North Kenova and cross over to the West Virginia side on the new bridge recently built by the Norfolk & Western. This would place the Hocking Valley Road in the coal and timber fields of West Virginia, and it is said that there is little doubt but that they will build.—[Manufacturers' Record.

A CURIOSITY has just come into the possession of a Newcastle-under-Lyme firm, Messrs. F. Silvester & Co. It is an old self-contained beam engine, 12 inch cylinder, 24 inch stroke (condensing) with governor, air pumps, etc. On an oval brass plate, fixed to the engine, is engraved the following: "Peel & Williams, Soho, Manchester, 1821. This engine was drawn through the streets of Manchester on the day King George was crowned, 19th July, 1821—George IV."—[Invention, London.

INDUSTRIAL SUMMARY.

New Enterprises:—

Frank H. Elson has broken ground at New Haven, Conn., for a boiler factory.

Watertown, N. Y., is to have another manufacturing industry in the shape of a plant to produce a new water-tube boiler.

The C. A. Murdock Manufacturing Co., of Kansas City, has been incorporated; capital, $100,000; incorporators, C. A. Murdock, J. A. Ebert and W. T. Kirchmeyer.

C. W. Bogart, Wm. Summer and W. A. Agard have incorporated, at Covington, Ky., the Bogart Gas Co. for the manufacture of gas engines. The capital stock is $25,000.

J. M. Vance and F. M. Strong, of Wheeling; G. W. Morrison, of Martin's Ferry, O., and others are organizing a $100,000 stock company, to erect brick works at Wheeling, W. Va.

The Ray Valve Manufacturing Co. have been incorporated at Elizabeth, N. J. The capital is $100,000, one-half of which is paid in, and will be used in starting works in Linden County, N. Y.

The Hecla Manufacturing Co., of Chicago, has been incorporated to manufacture machinery, hardware, tools, etc.; capital stock $150,000; incorporators, Fred A. Rowe, F. G. Gardner and Solomon Victor.

Plans have been prepared at Milwaukee, Wis., for a scissor factory to be erected in North Milwaukee, to be 44x150 feet, two stories, built of brick and to cost $30,000. A 130 horse-power engine will be used.

A charter has been issued to the Thayer Water Gas Furnace Co., of Pittsburgh, Pa.; the capital stock is $5,000, and the incorporators are Wm. C. Thayer, John Oakley, Thad. Sumner, John D. Armstrong, Edward B. Scully and Robt. D. King.

A charter was granted to the Ramona Iron & Steel Co., of Bellevernon, Pa., with $62,000 capital. The directors are F. Z. Shallenberger, Pittsburgh; James White, Irwin; S. M. Graham, Bellevernon; J. R. Stauffer, P. S. Loucks, Scottdale; A. Strickler and John Husband, Mt. Pleasant.

Articles of incorporation of the North Carolina Smelting Co. have been filed in New Jersey. The capital stock is placed at $1,000,000. The principal place of business will be Thomasville, N. C., and the operations of the company will be conducted in North Carolina, Virginia, West Virginia and Tennessee.

The Northington-Munger-Pratt Co. has been incorporated, at Birmingham, Ala., with W. T. Northington, of Prattville, as President; R. R. Munger, Vice-President and Daniel Pratt, Secretary, for the establishment of works in Birmingham, to manufacture the patent cotton gins, etc., of R. S. Munger. The capital stock is $150,000.

A new company has been formed and ground broken at Bridgeport, Conn., for a foundry for making alloys of copper with aluminum, silicon and manganese. The foundry will be 50x110 feet. Dr. Leonard Waldo, formerly connected with the Aluminum Brass & Bronze Co., of Bridgeport, and N. E. Stout, of New York, are at the head of the new enterprise.

NEW INCORPORATIONS.

The following recent incorporations, specially reported for *The Iron Trade Review*, are of interest to the iron and machinery trade:

Pittsburgh, Pa.—Brown & Co., incorporated; capital $5,000; for the manufacture of iron or steel or both; incorporators: Jno. B. Taylor, Allegheny, Pa.; A. Verner, Jas. Neale.

Chicago, Ill.—Seely Structural Supply Co.; capital, $100,000; to manufacture, buy, sell and erect structural materials; incorporators: Carl D. Bradley, Herman B. Seely, Phillip W. Herzog.

Cincinnati, O.—The Bartholomew Co.; capital, $25,000; for the manufacture and sale of vehicles; incorporators: Edward Wenning, Charlotte Wenning, J. A. Knapp, Geo. Lawton, G. E. Bartholomew.

Des Moines, Ia.—Steel Glove Co.; capital, $50,000; for the purpose of manufacturing stoves and parts, iron and steel goods; incorporators: Walter Hender, V. W. Mareah, C. B. Dobie, F. W. Cherry, L. F. Schulze.

Pittsburgh, Pa.—The Chaplin-Fulton Manufacturing Co.; capital, $60,000; for the purpose of manufacturing iron or steel or both; incorporators: L. Fulton, Pittsburgh, Pa.; Wm. Ralston, Elderton, Pa.; M. C. Chaplin, Sewickley, Pa.

Brooklyn, N. Y.—The John J. Hayes Machine Co.; capital, $10,000; for the manufacture and sale of machines of iron, steel or other metals; incorporators: John J. Hayes, Alonzo W. Fisk, Jr., both of Brooklyn, N. Y.; Alonzo W. Fisk, Rockville Center, L. I.

North Baltimore, O.—The Hardy Machine Co.; capital, $30,000; for the purpose of manufacturing and repairing drilling tools, boilers, engines, machines and castings, etc; incorporators: Jas. Hardy, M. B. Waldom, J. H. Chapman, J. Neil, E. Riddle.

Joliet, Ill.—Pioneer Tin Plate Co.; capital $125,000; to manufacture sheet iron and tin terne and galvanized sheets and all other steel and iron products and the smelting and refining of all metalic ores; incorporators: J. Palmer O'Neil, J. Davis Lewis, N. D. Lewis.

Canton, O.—The Canton Bridge Co.; capital, $150,000; for the purpose of manufacturing and selling iron and steel bridges, turn tables, structural iron work, etc.; incorporators: Wm E Sherlock, Vinton H. Hammond, John Brumbaugh, Harry W. Haines, John R. Reed.

East St. Louis, Ill.—The Spooner Refractory Ore Smelter Co.; capital, $10,000,000; to establish, maintain and manufacture smelters and smelting plants and deal in same, and refine, reduce and deal in ores, metals and smelting machinery of all kinds; Robert F. Looney, G. N. Scott, Harry M. Hill.

Chicago, Ill.—The Sterling Fuel & Light Co.; capital, $2,000,000; to manufacture and sell gas, gas machine and the rights to make and sell gas (under patents controlled by this company or which may hereafter be acquired) in

The Hackney Power Hammer

The Measure of Excellence and Profit.

The durability of the machine and the quantity —with quality—of work produced, is nowadays the measure of excellence and profit, and in this respect the "Hackney" is far in the lead.

It surpasses other power hammers in durability, speed and quality of work.

Write for catalogue and prices.

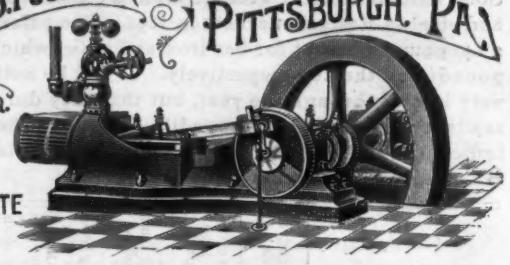
THE HACKNEY HAMMER CO.
Cleveland, O.

THE ÆTNA MEDIUM & HIGH SPEED ENGINE

Manufactured by THE TOTTEN & HOGG I. & S. FOUNDRY Co. PITTSBURGH, PA.

150 to 2000 H.P. Latest Design.
FOR ROLLING MILLS AND ALL OTHER WORKS WHERE LARGE POWER AND CLOSE REGULATION IS REQUIRED

CONTRACTS MADE FOR COMPLETE STEAM PLANTS.
ENGINES ALWAYS IN STOCK.



DIXON'S GRAPHITE PAINT

THOSE who use it say that one pound will cover 2 to 3 times more surface and last 4 to 5 times longer than any lead, mineral or metallic paint. A tin or iron roof well painted will not require repainting for 10 to 15 years.

JOS. DIXON CRUCIBLE CO.,
Jersey City, N. J

THE STIRLING COMPANY

MANUFACTURE

The Safest, Most Economical, Compact and Durable High Pressure

WATER TUBE BOILERS

All Wrought Steel. Large Mud Drum. Perfect Circulation.

By removing four manhole covers access is gained to every part of the boiler. Dry steam and great economy of fuel guaranteed.

GENERAL OFFICE: Pullman Bldg., Chicago.
PITTSBURGH OFFICE: Lewis Block.
NEW YORK OFFICE 74 Cortlandt St.
CLEVELAND OFFICE: Bradley Block.

Works: BARBERTON, SUMMIT COUNTY, OHIO.

the United States; incorporators: Edward S. Rill, Gerald C. Hopper, John Robertson.

DeKalb, Ill.—DeKalb Fence Co.; capital $40,000; to purchase and sell wire and manufacture and sell field and ornamental gates, fence posts and fence rails of metal and other field and ornamental wire fencing, wire mats and other wire goods; incorporators: Edward F. Shellaberger, C. D. Shellaberger, Herman E. Schuabel.

Additions, Enlargements, Removals, Etc.:—

The Giffin Wheel & Foundry Co., of Chicago, has increased its capital to $350,000.

The Western & Atlantic Railroad Co. will put new machinery in its machine shops at Atlanta, Ga.

The Buncombe Brick & Tile Co., Asheville, N. C., which recently increased stock, will probably put in additional machinery next Spring.

The Missouri Iron Roofing & Corrugating Co., of St. Louis, Mo., is making additions and improvements to its present plant. The present works will be rebuilt and an addition 140x30 feet erected.

The N. O. Nelson Manufacturing Co., of St. Louis, has filed papers in the circuit court to increase its capital stock by $500,000. After this is effected the name will be changed to the Nelson & Case Manufacturing Co.

Alex. D. Cunny, Cincinnati, O., has removed from 132 and 134 East Second street to Nos. 101 and 103 same street, where he has more room and better conveniences for carrying on his business, and will be pleased to see or hear from any one in need of patterns for machinery stores or architectural work.

An addition of four-sheet finishing mill is contemplated by the Standard Iron Co., of Bridgeport, O., if the city of Martin's Ferry will vacate certain streets now little used. The output of the extension would be 6,000 to 7,000 tons annually of eight-gauge sheets, making the standard one of the largest in the country.

Euneking & Trautman, Cincinnati, O., have removed from No. 211 East Pearl street to Fourth street and Eggleston avenue, where with more room and increased facilities they are prepared to fill all orders. They have had a very fair business for last year, and good, fair prospects for this year. They are skilled mechanics and give personal attention to all work done by them, and will be pleased to see or hear of any needing anything in their line.

Fires and Accidents:—

The Locke Machine Works, at Bradford, Pa., have been destroyed by fire at a loss of $10,000.

The plant of the Watkins Wire Spring Co., at Lockport, Ill., was burned on the 14th inst, causing a loss of $80,000.

Sparks from the blacksmith shop set fire to the Kenwood Bridge Works, at Grand Crossing, Ill., on the 24th inst. The loss to the building was $2,000 and to the contents $400. The loss is covered by insurance.

The factory of the New Monitor Works at Aurora, Ill., caught fire on the 10th inst., and was totally destroyed. Stock and machinery were insured for $12,000 and invoiced at about $20,000. The total loss was upward of $30,000.

The Carpenter Steel Works, in Reading, Pa., was totally destroyed by fire last week. The works employed nearly 300 men and made large quantities of a special brand of steel. The establishment at the time of the fire was working on a government contract of over $230,000 of steel projectiles for heavy ordnance, especially intended for the new guns which have recently been made and tested.

General Industrial Notes:—

One of the neatest and most tasty calendars for 1892 that we have received is from the well-known house of W. J. Burton & Co., Detroit, Mich., manufacturers of the celebrated "Eastlake" metal shingles. It is in colors, and they are quite true to nature. The calendar is an ornament to any office or home.

Messrs. Morris, Wheeler & Co., iron and steel dealers, of Philadelphia, have admitted to partnership in their firm Messrs. Benjamin T. Longstretch, Andrew Wheeler, Jr., and Frederick W. Morris, Jr. With the notice of this change we have reeeived a valuable little leaflet containing tables of weights and measurements of various kinds of iron and steel.

The recent orders and shipments of the Jeffrey Manufacturing Co., of Columbus, are as follows: Robbin's Coal Mining Co., Pittsburgh, Pa., 1 mining machine, 1 power drill; Sunday Creek Coal Co., Columbus, O., 3 mining machines, 2 power drills (second order); Gaslee & Lockwood, Evansville, Ind., 1 power drill; Hocking Valley Coal Co., Nelsonville, O., 5 mining machines, 3 power drills; Union Colliery Co., Victoria, B. C., 1 eclectic mine pump Egytian Mining Co., Du Quoin, Ill., 2 power drills; Harris Coal Co., Jobs, O.,; additional order 1 mining machine; Cambria Mining Co., Cambria, Wy., 5 power drills; Monongah Coal Coke Co., Monongah, W. Va., additional order 1 mining machine; New Pittsburgh Coal Co., Nelsonville, O., additional order 1 power drill; Glen Mary Coal Co., Glen Mary, Tenn., 3 power drills; Upson Coal Co., Shawnee, O., additional order 1 mining machine. H. D. Turney & Co., Columbus, O., complete electric plant, consisting of engines, boilers and electric machinery, including the Jeffrey mining machines. Coal handling machinery, elevators and conveyers for the following companies: Lubrig Coal Washing Co., Mt. Carbon, Ill.; Mt. Carbon Co., Mt. Carbon, W. Va.; Mud River Coal Coke Co., Mud River, Ky.; No. Bend Coal & Coke Co., No. Bend, O.; Texas & Pacific Coal Co., Thurber, Tex.; Union Pacific Railway Co., Rock Springs, Wy.; New Pittsburgh Coal Co., Farmersburg, Ind.; St. Louis & Big Muddy Coal Co., Carterville Ill.; St. Louis Ore & Steel Co., Murphysboro, Ill.; Louder Wooley Coal Co., Evansville, Ind.; Crystal Plate Glass Co., St. Louis, Mo.

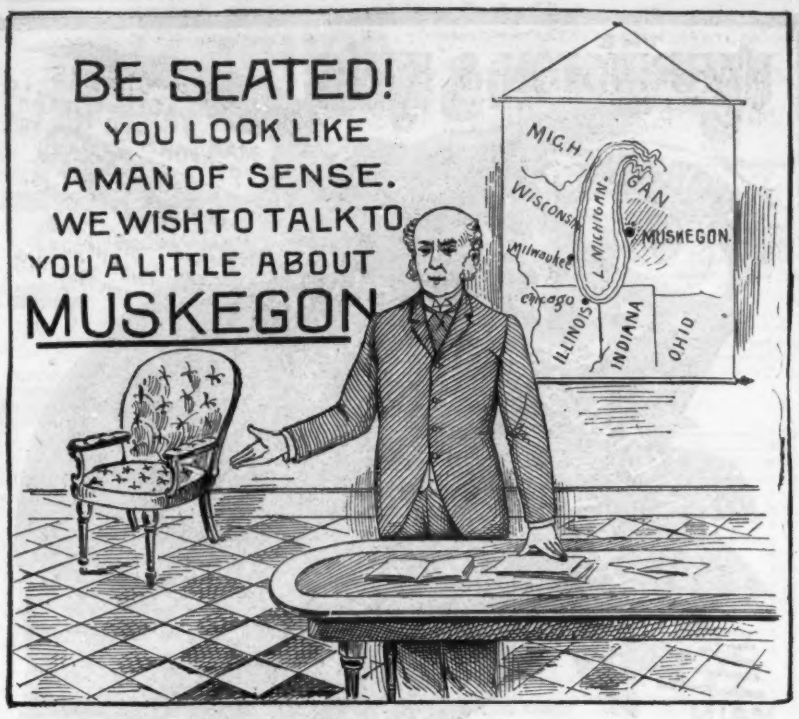
STEEL FOR PIPE.

The pipe and tube trade seems destined to soon become that line of manufacture in which soft steel will make its next great inroad upon wrought iron. A very large share of the puddling capacity now active is engaged in producing muck bar to be rolled into pipe skelp, and on the whole, the pipe manufacturers have steadily resisted the change. But their apathy is sure to be overcome by the difference in cost in favor of steel. Muck bar has been selling in Pittsburgh at $26.25, while slabs a few weeks since were purchasable at $24. The waste, both in heating, in crop ends and in scrap, is decidedly greater with the former along the whole line from crude to finished product.

Since the pioneer work in this direction was done at Wheeling, W. Va., steel skelp has been largely used by other makers, and consumers have had an opportunity to test and become familiar with steel pipe. One by one the obstacles to the introduction have been overcome. Manufacturers as well as consumers have long learned to dismiss as groundless the claim that soft steel cannot be welded. With the right kind of steel a good weld can be as certainly depended upon as with wrought iron. We have repeatedly witnessed tests which left no doubt as to the integrity of the weld. In fact, it may be fairly asserted that there is no half measure between a sound weld and an obvious failure.

It has been claimed that it is a very difficult matter to put a good thread on a steel pipe, and that therefore it should be condemned. This claim may be dismissed as being as untenable as the one that mild steel often exhibits the much-talked-of "mysterious" fractures of steel. In this respect it is the old story which welcomed the steel boiler and ship plates, and the steel nail.

We can understand the reluctance of iron pipe manufacturers to give up their puddling plant, and to put large sums of money into steel works. But those who cling too long to the old may find their interests seriously threatened, while those who soon follow the lead of a few conspicuously successful younger concerns will keep abreast of progress. Many have already done experimental work with steel skelp and are becoming large buyers of it. The signs indicate that the pipe trade is the next which will succumb to the victorious advance of steel.—[Iron Age.



I wish to say to you that for the Manufacturer or Investor

THE CITY OF MUSKEGON, MICH.,

offers greater opportunities, has more real merit than ANY young City of the United States.

I AM aware that this is a BOLD STATEMENT, but I am prepared to give **Facts and Figures that will astonish you.** Notice this map on the wall, the Lake Michigan District, four States, having a common center (Lake Michigan). These four States, bordering on the only great body of water lying wholly within the United States, have an average age as States—61 years—and no district of the world ever made such a record. These four States: Illinois, Indiana, Michigan and Wisconsin, had, by the census of 1890, 9,781,255 population, or nearly one-sixth of the entire population of the Union; they have over one-fifth of the railway mileage of the United States, and over one-tenth of the railway mileage of the world; and talk about rapid growth—**Look at this table:**

NAME OF STATE.	GAIN LAST 30 YEARS.	PRESENT POPULATION—1890.
ILLINOIS	2,106,585	3,818,536
INDIANA	1,514,117	2,189,030
MICHIGAN	1,340,679	2,089,792
WISCONSIN	907,016	1,683 897
TOTAL	5,868,397	9,781,255

This 30 years gain—5,868,397—is MORE than the present ENTIRE POPULATION of the following FIFTEEN STATES, viz:

1	California	1,204,002
2	Colorado	410,975
3	Connecticut	745,861
4	Maine	660,251
5	Vermont	332,205
6	New Hampshire	375,227
7	Rhode Island	345,343
8	Delaware	167,861
9	Montana	131,769
10	Nevada	44,327
11	Washington	349,516
12	Utah	206,498
13	Oregon	312,490
14	North Dakota	182,425
15	South Dakota	327,848
	Total	5,796,598
16	West Virginia	760,448
17	Maryland	1,040,431
18	Florida	390,435
19	Idaho	84,229
20	New Jersey	1,441,017
21	Wyoming	60,589
22	New Mexico	144,862
	Total	9,718,609

NOTE:—

MICHIGAN, which is twenty years younger than Illinois or Indiana, made nearly

23 PER CENT.

of the entire gain of this four-state district for the last thirty years.

THE FOUR-STATE GAIN WAS 5,868,397.

The present population of this four-state district is 9,781,255 or MORE than the 22 opposite: ☞

See U. S. Census 1890.

NOTE.—Michigan gained more population in the last 30 years—see table above—than the present entire population of Connecticut, Vermont and Delaware combined, or within 5,000 as much population as Oregon, Washington, Colorado, Montana and Nevada have combined.

NOTE.—Michigan gained more population in the last 10 years than **Virginia and Georgia** together gained, or than **Kentucky and Tennessee**, or **Alabama and Mississippi** combined gained.

YOU ARE SURPRISED AT THIS.

It was your impression that all the growth and wealth of this district was at the south end of Lake Michigan, but let me tell you right here that the great intrinsic wealth is farther north, in the Iron, Copper, Salt and Timber district. The hardwood forests have scarcely been touched. Michigan puts out yearly over half the Iron Ore mined in the United States; more than all the Southern States combined. Nearly every pound of Steel made in Pennsylvania and Ohio is made from Ore coming from this district, (96.3 per cent of the Steel output of the United States for 1890 is accredited to six States lying along the **Great Lakes**) and this output was 100,000 tons more than that of Great Britain for 1889—**MICHIGAN FURNISHED THE ORE.**

When You Have Absorbed

THE

FOREGOING FACTS AND FIGURES

You are beginning to reach a point where you will appreciate the location of the City of

MUSKEGON.

Notice on this Map on the wall, and in the Cut below,

MUSKEGON'S CENTRAL LOCATION

IN THIS GREAT

TEN MILLION POPULATION DISTRICT.

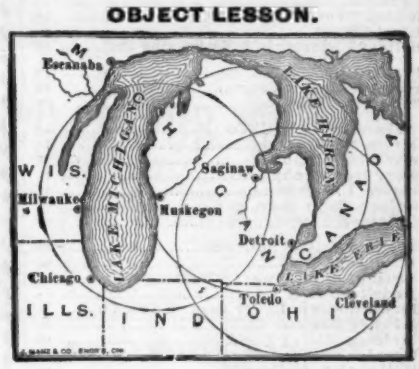
IT HAS THE BEST LOCATION IN MICHIGAN.

LOOK AT THIS!

3 MICHIGAN CIRCLES.
NAVIGATION CITIES.

Radius of Each Circle, 125 Miles.

OBJECT LESSON.



POPULATION:—Each Circle has in round numbers in United States population as follows:

SAGINAW CIRCLE, - -	1,725,000
DETROIT CIRCLE, - - -	2,600,000
MUSKEGON CIRCLE, - -	2,725,000

NOTE.—See Cram's Atlas, Census 1890, by Counties.

The great business centers of this Lake Michigan District are the Coast Cities. Muskegon is third in size on this great body of water and has the finest natural inside Harbor on Lake Michigan, sixteen miles of water front, all available, deep water—114 miles from Chicago and 85 miles from Milwaukee, with which two cities **navigation is open the year round.** Only 175 miles by navigation from the greatest **Bessemer Ore** shipping docks in the **world.** Rare combination—**Raw Materials, Best Shipping Facilities and Best Markets** in the United States.

IT IS AN ACTUAL FACT that cargoes of heavy merchandise can be carried from **Muskegon** to the business center of **Chicago quicker** and for **less money** than the same quantity can be brought in **by rail** from points 10 to 15 miles outside the limits of Chicago. No experiment. Doing it now.

These great advantages are beginning to be appreciated. Twenty-one factories have been located in the last eighteen months. Among the factories secured are: **The Alaska Refrigerator Co., Large Rolling Mill, New Steel Works, Chase Bros. Piano Co., Sargeant's Invalid Chair Co., Nelson Piano Co., Mich. Washing Mach. Co., Malleable Iron Works, Machine and Foundry Co., Electric Alarm Co., Shaw Electric Crane Co., Houck Furniture Co., Electrical Power Co., Muskegon Cracker Co., Standard Oil Co. Barreling Works, Morton Key Seating Co., Kelly Bros. Mfg. Co., Heaps Earth Closet Co., Gray Bros. Mfg. Co., Hartshorn Shade Roller Co., New Flouring Mill**—All just completed or now building.

Why do you "CHASE RAINBOWS" on the outskirts of the Country, and invest at high prices, when you can get property near the great business center of the "Central West" for half the money, and having double the intrinsic worth?

A GOLDEN OPPORTUNITY IS BEFORE YOU.

THE MUSKEGON IMPROVEMENT CO., composed of leading citizens, have just commenced their **2nd Great Lot Sale. 2,000 Lots** at the uniform price of **$165 each,** location to be determined by allotment as soon as 50 per. cent. is paid in. **Terms of Subscription:** $15 down, balance $10 each month. $165 secures you a good lot, 50x125 feet, with alley in rear, in the phenomenal addition **"MUSKEGON HEIGHTS,"** which addition is pronounced by Real Estate Experts to be as fine an addition as any city in this country can show. It is less than one and one-half miles from the business center of the City of Muskegon, with which it is connected by handsome, paved streets and an Electric Street Railway. This addition has twelve **large** factories located upon it **now;** has good Hotel, Brick Blocks and Stores, Depot, three paved streets, a large number of good residences. Every lot is level and desirable. **There is not a lot on the addition worth less than the price asked.** The net avails of this sale to be used to locate ten more factories. All the factories on Muskegon Heights are solid, substantial brick structures, the smallest is 50x150 feet, 2 stories; the largest plant is two buildings, each 60x400, one 2 stories, the other 3 stories high; the latter plant is owned by four Bank Presidents and is the largest factory of its kind in the world. **DON'T MISS THIS OPPORTUNITY. Such chances for sure paying investment are rare.**

If you wish to subscribe, remit by Money Order, P. O. or Express, or Bank Draft, to

F. H. HOLBROOK, Sec'y Board of Trade, or

HOLBROOK & McDONALD, SALES AGTS.,

MUSKEGON IMPROVEMENT CO.

REFERENCES: Any Bank in the City of Muskegon. Send for Maps, Plats and Information.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month the double dagger (‡) once in three weeks.

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Dealer in Machinery, DETROIT, MICH.

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to place a certain amount of advertising for you in the way we think will do you the most good, you should send an explicit statement of what you wish to accomplish, and make suitable arrangements for payment. Your order will then receive all the attention that it requires.

If you wish an advertisement

prepared and a plan of advertising marked out; to be told what papers you should use, and what the cost will be, we will furnish the advertisement and the plan—either or both, and submit them for your consideration, together with our bill for the service.

For preparing advertisements,

electrotypes and estimates the advertiser pays us. For the expense of placing advertisements and watching the fulfillment of contracts we are paid by a commission allowed by the publisher of the paper in which the advertisement appears.

If you want to learn

all the ins and outs of advertising without any cost or trouble, read PRINTERS' INK regularly, carefully, studiously; issued weekly, $2 a year.

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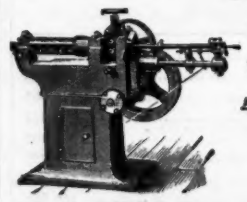

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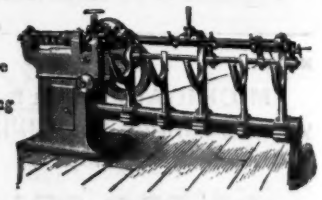
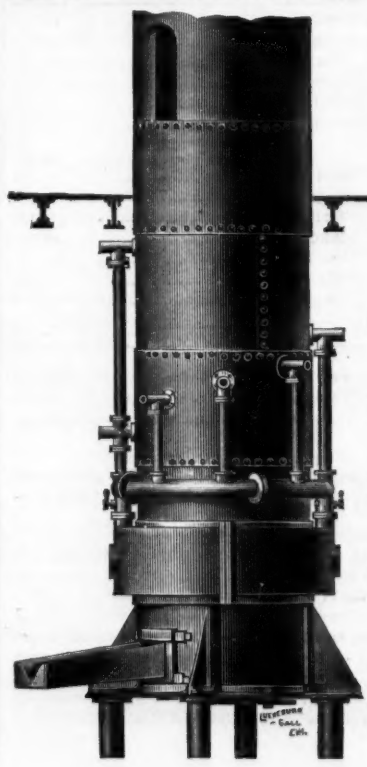
Builders of Machinery for Hardware Manufacture.
Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Sprue Cutters, Etc.





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—MANUFACTURERS OF—

BESSEMER AND OPEN-HEARTH STEEL,

Blooms, Billets, and Slabs. Steel Rails, Steel Beams, Channels and Angles. Steel Forgings.
Bar, Spring and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire.
Iron and Steel Plates. Galvanized and Black Sheet Iron and Steel.
Corrugated Iron Roofing.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 00@16 75; Southern Coke No. 2 Foundry, $15 00@15 75; Southern Coke No. 3 Foundry, $14 25@15 00; Southern Coke No 1, Softeners, $15 00@15 75; Southern Coke No. 2, Softeners, $14 25@15 00; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@ 17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 00@18 00; Lake Superior Charcoal Nos. 1 to 6, $17 00@18 00; Tennessee Charcoal No. 1, $17 00@18 00; Tennessee Charcoal No. 2, $16 50@17 50; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $14 75@15 25; Southern coke, No. 2 and No. 1 soft, $13 75@$14 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 00; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $17 00@17 50; Hanging Rock Charcoal, No. 1 foundry, $19 75@21 00. MILL IRONS—Standard Southern Coke, grey forge, $12 50@12 75; Standard Southern Coke, mottled, $12 25@12 50; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 00@20 00; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $16 00@16 50; Mahoning and Shenango Valley strong, No. 2 Foundry, $15 00@15 50; Ohio Softener No. 1, $16 50@00 00; Ohio Softener No. 2, $15 50@00 00; Jackson Co., Silvery No. 1, $18 00@00 00; Jackson Co. Silvery, No. 2, $17 00@00 00; Lake Superior Charcoal, $18 50@00 00; Tennessee Charcoal, $18 25@00 00; Southern Softener No. 1, $15 75@00 00; Southern Softener No. 2, $15 00@00 00; Southern Strong No. 1 Foundry, $16 75@00 00; Southern Strong No. 2 Foundry, $15 75@00 00' Alabama Car Wheel, $19 75@20 75; Hanging Rock Charcoal, $21 00@22 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 50@14 00; Southern coke No. 3, $13 00@13 25; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 00@17 00; Southern charcoal, No. 2, $15 50@16 00; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@12 75; Cold short, $12 25@12 50; Mottled, $11 75@12 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 00@19 50; Southern (other brands), $17 00@18 00; Lake Superior, $20 00@21 00.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 50@14 75; Southern Coke No. 3, $13 75@14 25; Southern Grey Forge, $13 25@13 50; Southern Charcoal No. 1, $17 25@17 75; Southern Charcoal No. 2, $16 75@17 25; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 50@20 00; Southern, $19 50@20 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $5 65.

DETROIT (reported by William F. Jarvis & Co): Lake Superior Charcoal, all Numbers, $17 00@18 00; Lake Superior (coke) Bessemer, $16 50@17 00; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50; Jackson County (Ohio) Silvery, $18 25@18 75; Old Car Wheel, $00 00@00 00. Connellsville Coke, $0.00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 50@15 00; Southern Coke No. 2 Foundry $13 50@14 00; Southern Coke No. 3 Foundry $13 00@13 50; Grey Forge, $12 50@12 75; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $18 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $15 50@16 00; No. 2 Foundry, $14 50@15 00; Grey Forge, $13 50@13 75; White and Mottled, $13 00@13 25; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal, $22 00@26 00; Bessemer, $15 25@15 75.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch	1 70
4½ to 6 by ¾ to 1 inch	1 55
1½ to 6 by 1¼ to 2 inch	2 15
1¼ & 1½ by ⅜ to ¾ inch	1 85
1 & 1¼ by ⅜ to ¾ inch	1 95
⅛, ¼ and ⅜ by ⅜ to ⅝ inch	2 15

Round and Square.

1 to 1¾ inch	1 75
2 to 2¾ inch	1 95
2¾ to 3¼ inch	2 25
3¾ to 4 inch	2 75
4¼ to 4½ inch	3 25
4¾ to 5 inch	3 45

Ova

⅝ to 1¼ inch	2 15
⅞ to ¾ inch	2 25
⅛	2 55
¼	2 95

Half Oval and Half Round.

⅝ to 3 inch	2 85
⅞ to 1¼ inch	2 45
⅞ to ¾ inch	3 05
⅝	3 25
⅛	4 75

Heavy Band.

¼ to 6 by ¼ and 5-16 inch	1 55
¾ to 1½ by ¼ and 5-16 inch	2 05
⅛ to ¾ by ¼ and 5-16 inch	2 25
⅛ to ¾ by ½ and 5-16 inch	3 75

Hoops.

1¼ to 4, Nos. 13 to 15	2 55
1¼ to 2, Nos. 16 to 18	2 65
1¼ to 2, No. 19	2 75
1¼ to 2, No. 20	2 85
1¼ to 2, No. 21	2 95
1¼ to 2, No. 22	3 05
15-16, 1 and 1¼, Nos. 13 to 15	2 75
15-16, 1 and 1¼, Nos. 16 to 18	2 85
15-16, 1 and 1¼, Nos. 19 and 20	2 95
15-16, 1 and 1¼, No. 21	3 05
15-16, 1 and 1¼, No. 22	3 15
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	3 05
⅞, Nos. 19 and 20	3 15
⅞, No. 21	3 25
⅞, No. 22	3 35
13-16, Nos. 13 to 15	3 15
13-16, Nos. 16 to 18	3 25
13-16, Nos. 19 and 20	3 35
13-16, No. 21	3 45
13-16, No. 22	3 55
¾, Nos. 13 to 15	3 25
¾, Nos. 16 to 18	3 45
¾, Nos. 19 and 20	3 55
¾, No. 21	3 65
¾, No. 22	3 75
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 65
11-16, Nos. 19 and 20	3 75
11-16, No. 21	3 85
11-16, No. 22	3 95
⅝, Nos. 13 to 15	3 75
⅝, Nos. 16 to 18	3 95
⅝, Nos. 19 and 20	4 05
⅝, No. 21	4 15
⅝, No. 22	4 25
⅝, No. 23	4 45

Light Band.

1¼ to 6 by ¼ to 3-16 in	2 20
1¼ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ¼ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅞ and 13-16 by ¼ to 3-16 in	2 70
⅞ and 1 3-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ¼ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ¼ to 3-16 in.	3 30
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅜ to 3-16 in	3 60
½ by Nos. 11 and 13	3 70

Wagon Box Iron.

⅝ inch, beveled edge, by Nos. 11 and 12	2 80
⅝ inch, " " " 13 and 14	3 00
¾ inch, " " " 11 and 12	3 10
¾ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 45
No. 15 to 17	2 55
No. 18 to 21	2 75
No. 22 to 24	2 85
No. 25 to 26	2 95
No. 27	3 25
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 25
C No. 1, " "	2 40
C H No. 1 " "	2 50
C H Flange, " "	3 50
Extra Flange, "	4 00
Solid Fire Box "	4 75

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 25
Shell	2 50
Flange	2 75
Marine Flange	3 00
Fire Box	4 00

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 110 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	68
9-16 to ⅞ in "	68½
7-16 to ⅝ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅛ to 11-16 and 4⅛	10
⅛ to 6 in	10¼
¼ to 9-32 and 6⅛ to 7 in	11
3-6 in	13

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅛ thick	8

Bessemer and O. H. Steel.

Machinery	base price, 2 35
Tire	" 2 25
Spring	" 2 80
Sleigh Shoe	" 2 50
Toe Calk	" 2 35
Cutter Shoes, tapered and burr.	" 2 75

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	15c

Burden Boiler Rivets.

⅛, ¼, 11-16 and ⅝ inches diameter	4 00
Bridge ⅛, ¼, 11-16 and ⅝ inch diam	4 00

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	NET TONS
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

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Stove Plate	8 75
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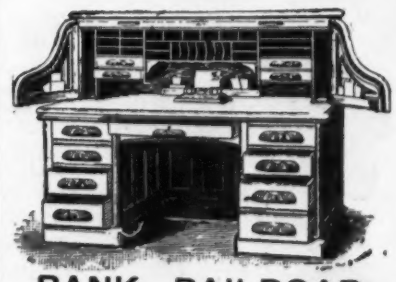

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Wrights.....₩ lb 12

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Blacksmiths' { Hill's.....dis 40 / Bullock's.....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shults Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned....dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 12

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 65

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¾".....dis 50&10
Morse Taper and Straight shank Larger than 1¾".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4½c	5¾c		3 c
0 lb cans, 10 in case	6 c	6¾c		3 c
0 lb cans, less than 1	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	⅜	5-16	½	⅝	¾	⅞	1
Square	8	7	5¾	4¾	4	3⅜	2⅞
Hexagon	15⅜	11⅜	8⅝	6	5⅛	4⅜	3
Washers	9	8	7	5	4⅜	4⅜	4⅜

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate
{ Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 12@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 40

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15½
Sisal, ½ inch and over.....₩ lb 13½

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 30

Saws.

Disston's Circular.....dis 40@10
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 30
Atkins' Cicular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron.....dis 72½
Round head iron.....dis 67½
Flat head brass.....dis 72½
Round head brass.....dis 65
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls		21c@29c
No. 18 " " ¼ and ⅛ "		18c@28c
No. 36 " " ¼ and ⅛ "		16c@27c
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine		11½c
3-Ply " 1 lb Balls		12@12½c
3-Ply " 1½ lb Balls		11@11½c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire, regular.....$3.00@lb dis 5

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 5
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis
William's " " .....dis
Alligator " " .....dis

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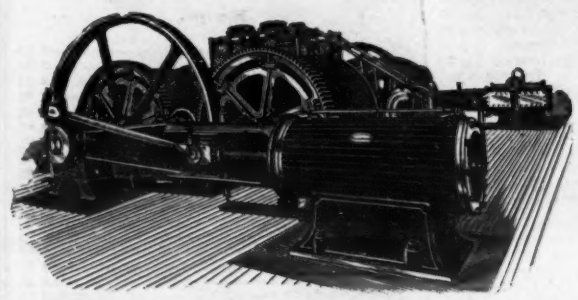

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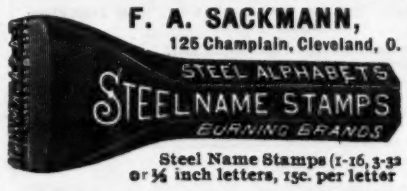

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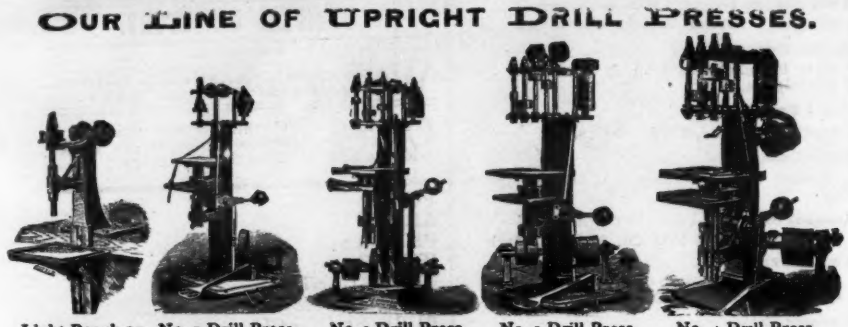

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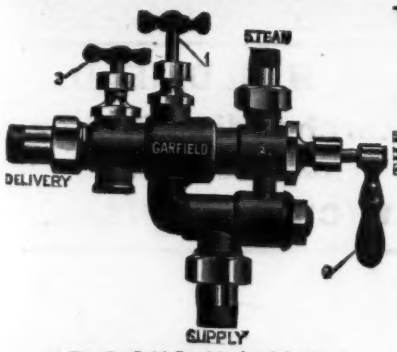

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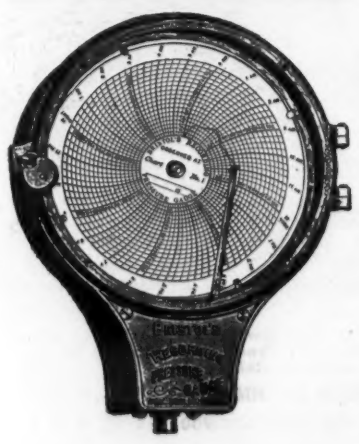

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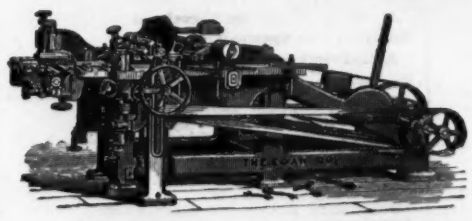

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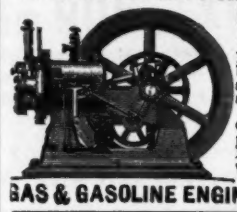

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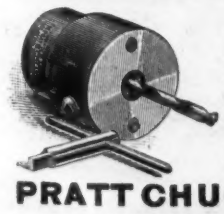

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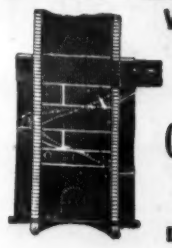

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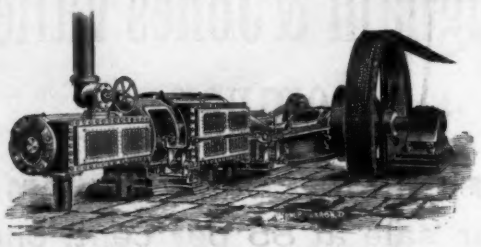

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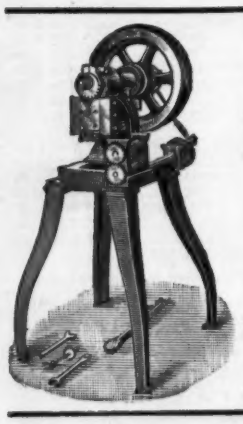

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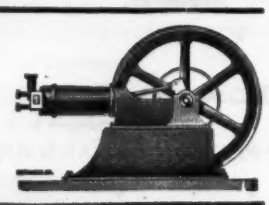

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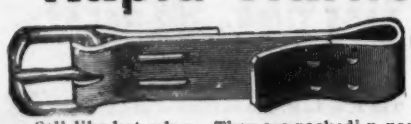

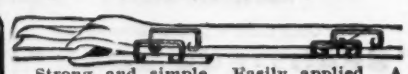

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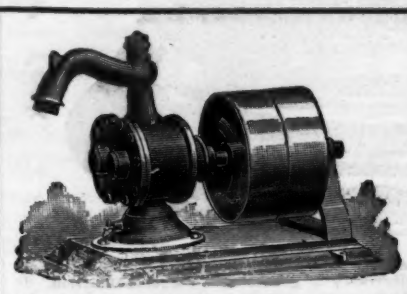

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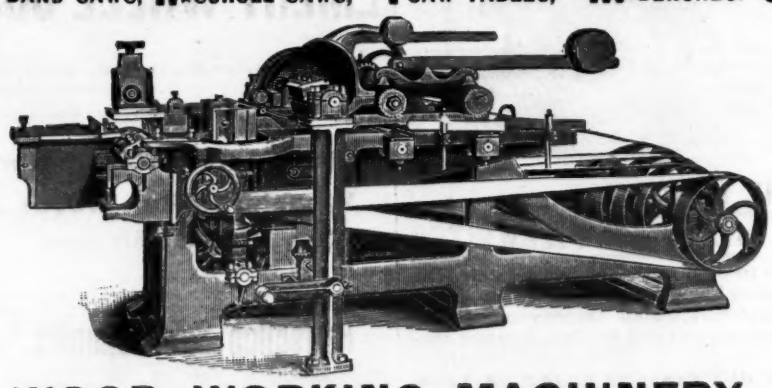

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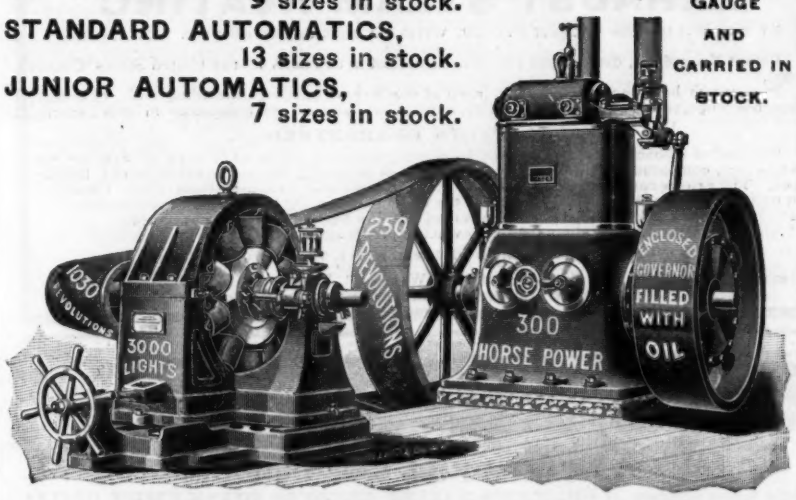

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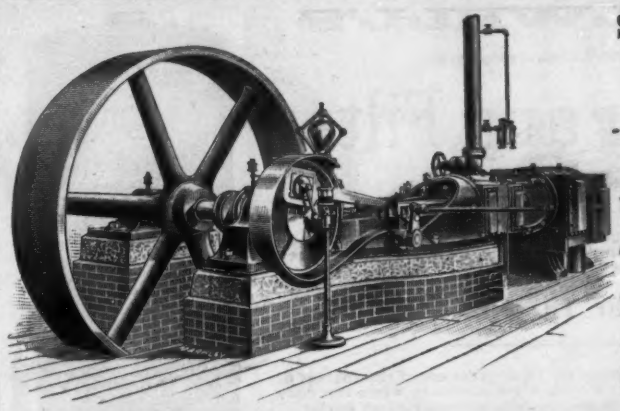

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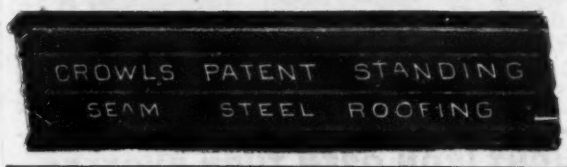

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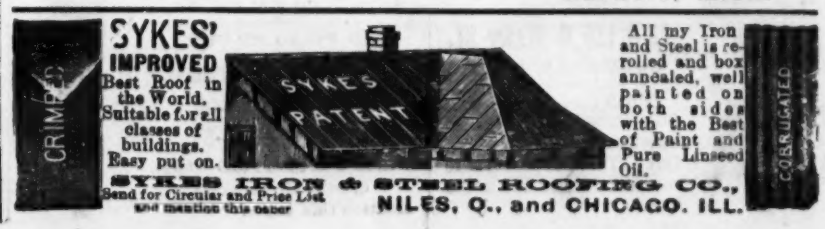
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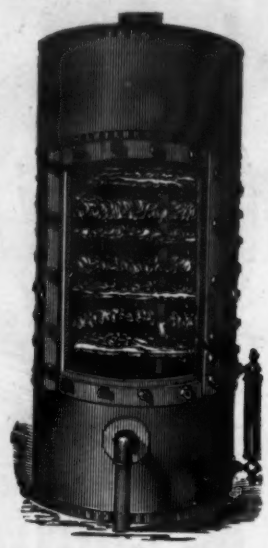

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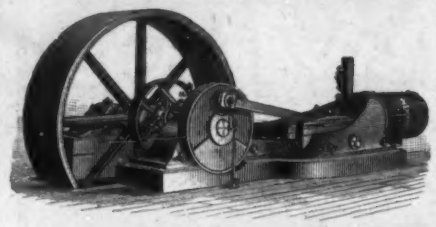

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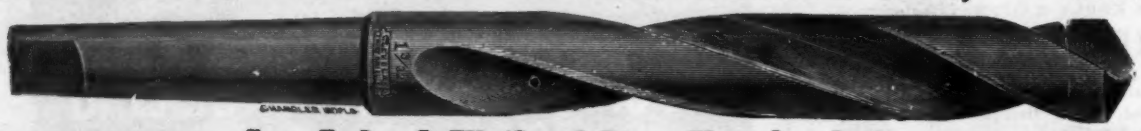

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